POWER PLANT ENGINEERING

Established Over 35 Years

VOL. XXXV CHICAGO, JANUARY 15, 1931 No. 2

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Published on the 1st and 15th of each Month by the

Technical Publishing Co., 53 West Jackson Blvd., Chicago

New York Office, 171 Madison Avenue

Subscription price $2.00 a year in the United States and possessions. Canada $2.75 a year. Other countries $3.50 a year. Single copies 15 cents.

Copyright 1931, by Technical Publishing Co.

Entered as second class matter May 1, 1908, at the Post Office at Chicago, Illinois, under the Act of March 3, 1879.

Member, Associated Business Papers, Audit Bureau of Circulations.

Circulation of this issue 23,450

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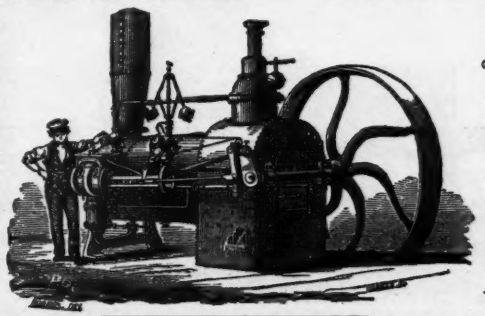

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" 48	do	240	" 58	do	440
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Heroes of the Civil War

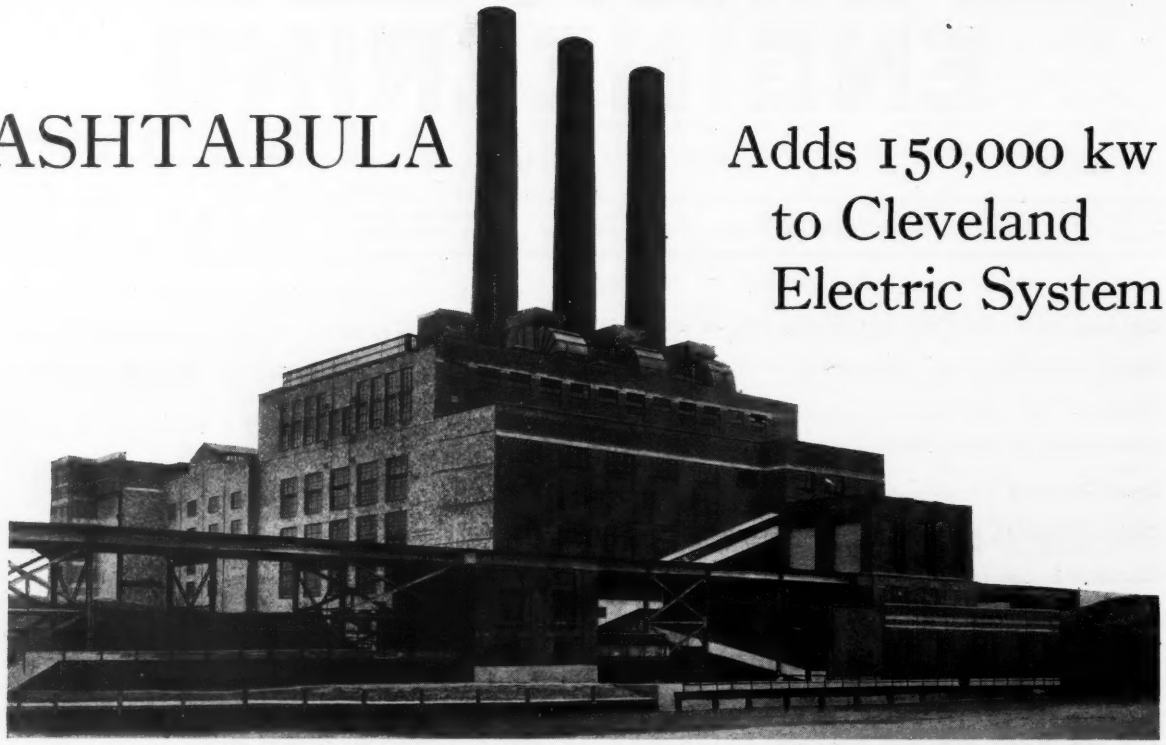
IN THIS DAY of frank, outspoken biographies which hurl popular idols from their pedestals and leave the fragments scattered about our feet, we rather hesitate to mention an innocent but heretofore unpublished incident in the life of Abraham Lincoln.

As we all know, Lincoln in his youth was a lumberman or rail splitter. In his chosen profession he achieved somewhat of a local reputation, when suddenly and without explanation he switched his activities to law. For generations his actions have been attributed to temperament. Believe it or not, investigations carried on by our Research Department in connection with the early development of prime movers in America uncovered the fact that he was driven out of rail splitting by the spectre of machine production.

Steam-driven portable saw mills had reached such a state of production that the independent lumberman was forced to change occupation. In a way, one may say that the steam engine was influential in placing a strong hand at the helm of our country during the crisis of the emancipation struggle.

One of the engine units of a type that was responsible for this is shown above, although the unit illustrated is a somewhat later (1857) model. Of course, every piece of equipment cannot be responsible for making a president but each new piece of equipment makes industrial history. Many new developments of the past year, that will make future industrial history, are reviewed in this issue.

ASHTABULA Adds 150,000 kw to Cleveland Electric System



NEAR THE EASTERN END of the Cleveland Electric Illuminating Co. system, the company has recently placed in operation the new Ashtabula station with a capacity at present of 150,000 kw. in three 50,000-kw. units. The present building is designed to house four such units; the ultimate capacity of the plant is to be 400,000 kw.

FIG 1. GENERATOR CONTROL BOARD

Because of the extremely satisfactory operation of the company's Avon Station, it was decided to duplicate many of the main features of that plant in the Ashtabula Station, the increase in turbine unit size to 50,000 kw. being the most important change. Not only are the general architectural features and arrangement of Ashtabula the same as those of Avon but also the general type of equipment employed is much the same.

Principal features of Ashtabula are shown in the illustrations and drawings. The general steam cycle is designed for simplicity, steam extracted from only two stages of the turbines being employed for feedwater heating. One turbine-generator and two boilers constitute a unit, operating at 375 lb. pressure, 700 deg. Pulverized coal is the fuel, prepared in a bin or central system. One of the interesting items in this system is the use of an individual unit heater at each pulverizing mill to supply heated air for mill drying. To eliminate dust from the flue gas, electrostatic precipitators are installed between the induced draft fans and chimneys. A combustion control system is installed. In the switch house, individual breaker cell ventilation has been employed.

As can be seen from Fig. 7, the system of the Cleveland Electric Illuminating Co. supplies power to a territory of 1700 sq. mi. in Northeastern Ohio, the area extending about 100 miles along Lake Erie. Near the center of the load is Lake Shore Station at Cleveland, near the Western end of the system is Avon Station, 23 mi. from Cleveland Public Square, while the new Ashtabula Station is near the East end of the system a short distance east of Ashtabula. The plant is connected by 132,000-v. high-tension lines with the two other main stations of the system.

Architectural treatment of Ashtabula is similar to

that of Avon Station, using the same type of building, constructed of red face brick with buff sandstone trim.

The most impressive portion of the entire plant is the turbine room, where simplicity of arrangement and a pleasing color scheme are the predominating features. The operating floor, 100 ft. wide and 216 ft. long, contains only the prime movers, all auxiliary equipment being located at the basement floor level. Walls are a combination of two shades of buff-colored brick and terra cotta, treated in a classic design of brick pilasters. The floor is of red tile with the machine casings, railings, fixtures and doors carried out in a green and bronze color combination. A large skylight extends the full length of the room, together with long panel windows at each end, providing ample lighting.

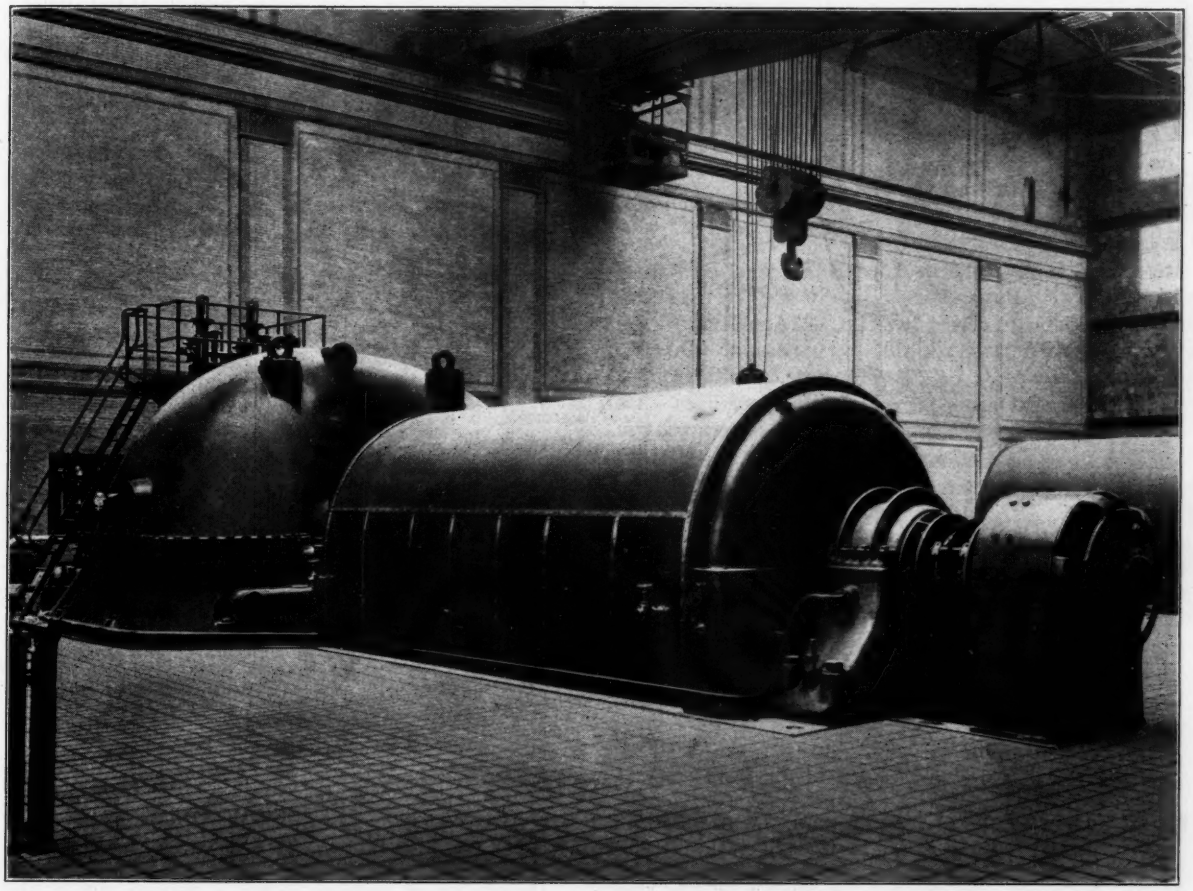


FIG. 2. ONE OF THE THREE 50,000-KW. TURBINE-GENERATORS AT ASHTABULA

Three 50,000-kw. units are housed in the present room with space provided for a fourth unit of 50,000 kw. A traveling electric crane of 125 t. capacity and a standard gage railroad track, extending the full length of the room on the generator side, provide excellent facilities for handling the larger units.

The three turbine-generators are 80-per cent-power-factor, 17-stage, 1800-r.p.m. impulse machines, each having a continuous rating of 50,000 kw. and a peak capacity of 62,500 kw. Steam is supplied to the turbine throttles at 375 lb. pressure and 700—725-deg. total temperature.

Electrical characteristics of the three generators are identical; 13,200 v., three phase, 60 cycle, with excitation provided by direct-connected exciters or by auxiliary equipment. Each generator is equipped with an 18,000-sq. ft., 6-section, fin-type, surface air cooler and a totally enclosed ventilating system, provided with atmospheric relief doors. High-pressure steam jets are inserted in the end bells of the generators for fire protection.

Turbines exhaust into condensers having 57,000 sq. ft. of surface; they are of the single-pass surface type, rigidly connected to the turbine casing and spring supported. A two-stage steam air ejector with capacity of 12½ c.f.m. at 1 in. absolute serves each condenser. Two 8-in., three-stage, centrifugal, 1200-g.p.m. condensate pumps, and two 48-in., 6300-g.p.m. circulating pumps serve each unit. Under normal operation these pumps will be driven by motors; one pump of each type, however, is equipped for dual steam turbine or motor drive. The circulating water lines are fitted with 48-in. hydraulically-operated gates, arranged for remote control.

Ultimate full load operation will require 1,008,000 g.p.m. of circulating water for eight units. The intake channel extends 1500 ft. out into Lake Erie, is 150 ft. wide, and normally has a depth of fifteen feet at low water.

Circulating water is drawn to the condensers through

a set of stationary trash racks into six 22-ft. revolving water screens, then approximately 425 ft. through an intake tunnel beneath the turbine-room basement. Intake wells for each group of circulating pumps are supplied by branches from this tunnel. The discharge tunnel extends the entire length of the turbine room, beneath the basement floor. A portion of the discharge water may be diverted to the intake to prevent formation of ice in front of the traveling water screens.

Main steam piping is so arranged that two boilers and one turbine-generator constitute a unit. Each pair of boilers is connected to one common steam header, running parallel to the turbine room, in order that the boilers of one group may serve the turbine of another group. Seamless steel tubing, equipped with cast-steel valves and fittings and Van Stone flanges, is used for all high pressure steam and water piping.

All lines are of ample capacity, designed for a maximum steam velocity of 10,000 ft. per minute. Lines carrying high temperature steam are insulated with 1½-in., high-temperature insulation and 2½ in. of sponge felt covering. Boiler and turbine main stop valves are motor-operated and may be controlled either locally or from a remote section of the plant.

All auxiliaries normally are motor-operated with the exception of the boiler feed pumps. Additional security is provided for through the installation of dual driven condensate, circulating pumps and direct-current generator sets. Current for the electric auxiliaries is obtained from the main generators through station transformers.

Figure 8 shows the flow of steam, condensate and feedwater. The temperature of feedwater entering the economizers is kept constant at 200 deg. F. and all heat recovery devices are designed and used to afford reliability and ease of operation. From the condenser hotwell, the water passes first to the generator air cooler, then through the steam jet air ejector of the condenser, thence through the 15th and 13th stage bleeder heaters respectively. From the 13th-stage heater the condensate is sent to a small barometric heater condenser where it mixes with the exhaust from the various steam-driven auxiliaries in the plant. From here it flows to the feedwater suction header, which is provided with cross connection to a 29,200-gal. storage tank. This is used to compensate for line surges during periods of unbalanced steam conditions between boilers and main units.

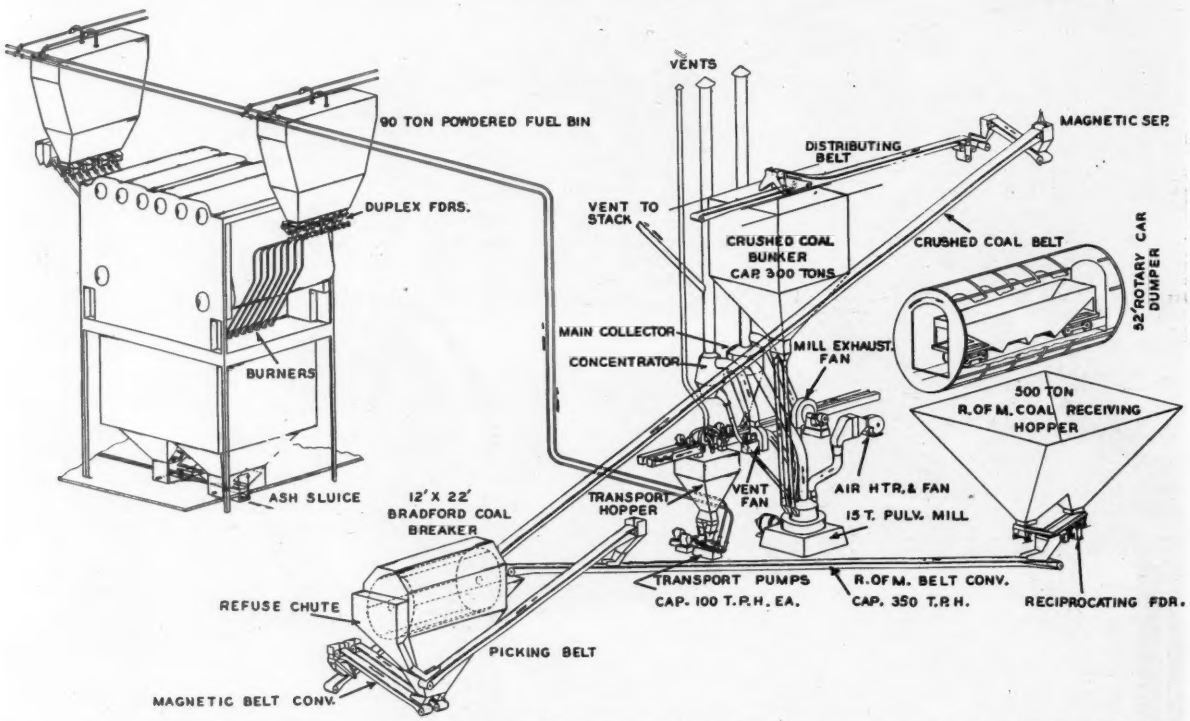


FIG. 8. DIAGRAM OF ASHTABULA COAL-HANDLING EQUIPMENT, CAPACITY 350 T. AN HOUR. COAL IS PULVERIZED IN A BIN SYSTEM

Deaeration of makeup water is carried out in the main condensers and the condensate leaving these condensers is free from oxygen. To prevent re-absorption of oxygen by the condensate between the condensers and feed pump, the condensate is either kept under pressure in piping and closed heaters or is boiled in the open heater or cone condenser. Venturi meters measure all feedwater going to the boilers.

Boilers and Furnaces

Steam for the three turbine-generator units is made in six boiler units, as shown in Fig. 5. These boilers are arranged on two sides of the boiler room with three firing aisles parallel to the axis of the turbine room, the present boiler room being large enough to accommodate eight boilers. Six twin vertical bent tube boilers are installed at present, operating at 395 lb. pressure to give a total maximum steam temperature of 750 deg. Each boiler has 32,560 sq. ft. of water heating surface, 6778

sq. ft. of superheating surface and 23,232 sq. ft. of economizer surface. Each boiler is designed to produce a maximum of 416,000 lb. of steam an hour, corresponding to 400 per cent of rating, which is sufficient to maintain approximately 80 per cent full load on one of the main units.

Draft is maintained by one induced draft fan per boiler unit, supplemented by a reënforced tile concrete stack for each two boilers, rising 246 ft. above the burner level. Induced draft fans are of the turbo-vane type, driven by two-speed induction motors. The fans are designed for a maximum static pressure of 15 in. of water when passing 327,000 cu. ft. of gas a min.

Passing from the induced draft fan, the flue gas is cleaned by a Cottrell precipitator designed for efficiency of 90 per cent at 128,500 c.f.m. capacity. Feedwater to the boilers is manually controlled as previous experience with similar type and size of boiler has proved satisfactory. Each boiler is equipped with a combustion control system. Four 1500-g.p.m. centrifugal boiler feed pumps, which are driven at 2500 r.p.m. by 600-hp. steam turbines, are regulated by excess pressure governors.

Air-Cooled Furnaces Are Used

As shown in the cross section, the twin bent-tube vertical boilers are set over a common furnace fired from two sides and built with air-cooled side walls and ash hoppers. Secondary air for combustion enters the air passage surrounding the furnace through hollow wall dampers in the non-firing sides of the furnace. As the air passes around the furnace it is preheated and enters the furnace through ports below the burners.

To lower the temperature of the hopper bottom and facilitate removal of dry ash, a water screen is extended across the lower part of the furnace and is connected into the boiler circulating system. Volume of each furnace above the water screen is 32,560 cu. ft. Ash is removed through air-operated ash gates to a sluice serving all boilers.

Coal Is Pulverized in a Bin System

For firing these furnaces pulverized coal prepared in a bin system is used. Present mill grinding capacity is 90 t. an hour. The coal is dried in the mills, a heater unit supplying each mill with its drying air. Each air heater unit has 1260 sq. ft. of heating surface and a fan of 7200 c.f.m. capacity. The air blast from the heaters reduces the moisture content to approximately 3 per cent, reducing maintenance to a minimum and increasing capacity.

Crushed coal is fed by gravity from the green coal bunker to the six 15-ton, 6-roll impact pulverizing mills where it is pulverized to pass 65 per cent through 200 mesh. Motor-driven exhausters remove the coal from the mills and discharge it to cyclone separators whence four screw conveyors take it to the receiving bin. The screw conveyors have a total capacity of 60 t. an hour and the receiving bin a capacity of 16 t. Two fuel transport pumps are installed at present, each of 100 t. an hr. capacity. By means of screw feed and compressed air, these force the pulverized coal from the receiving bin to the two 90 t. pulverized fuel bunkers above and in front of each firing side of the boilers.

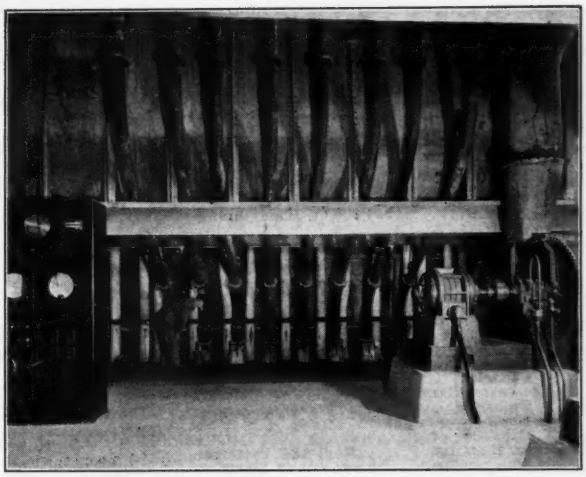


FIG. 4. FRONT OF BOILER, SHOWING PULVERIZED COAL BURNERS, BOILER CONTROL BOARD AT LEFT AND PRIMARY AIR FAN AT RIGHT

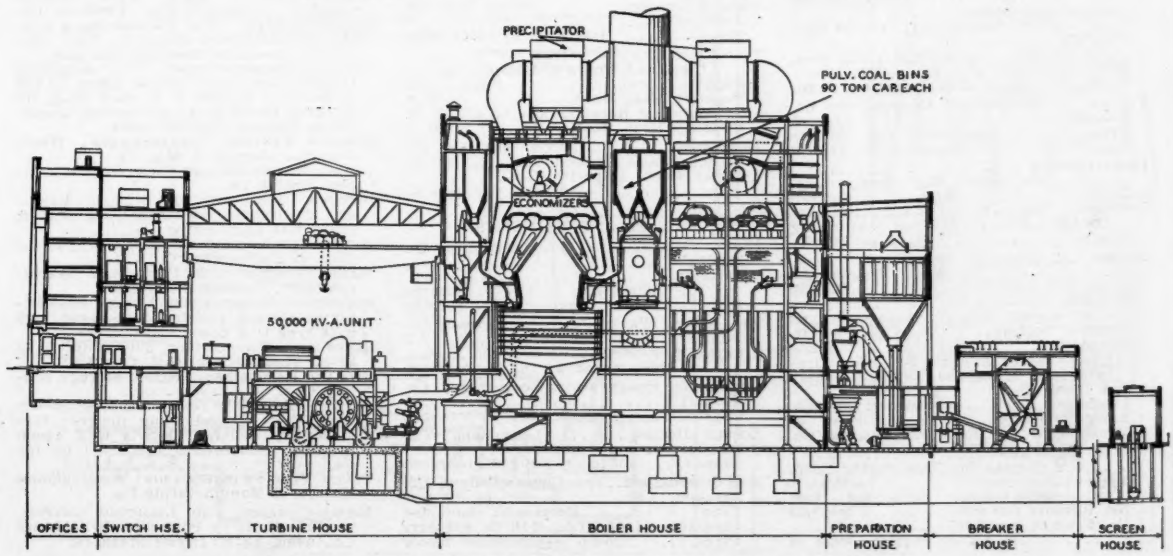


FIG. 5. GENERAL CROSS-SECTION THROUGH ASHTABULA PLANT

Equipment in Ashtabula Station of Cleveland Electric Illuminating Co.

Coal Storage and Handling

Coal Storage ..... Industrial Brown Hoist Corp.
Type Machine ..... Bridge Crane
Capacity Crane ..... 220 t. coal per hour
Capacity Storage Area ..... 224,000 t. (normal)
Capacity Storage Area ..... 254,000 t. (maximum)
Coal Handling ..... Car dumper and belt conveyor
Capacity ..... 350 t. per hour
Capacity Track Hopper ..... 700 t.
Track Scales ..... Standard Scale & Supply Co.
Capacity Rotary Car Dumper ..... 800,000 lb.
Capacity Hopper Dumper ... 335,000 lb.
Car Dumper ..... Wellman Eng. Co.
Capacity ..... 20 cars per hour
Conveyor Belts ..... Link-Belt Co.
Unloader ..... Traveling tripper
Number of Bunkers served 6
Capacity of Bunkers ..... 300 t.
Coal Breaker ..... Heyl and Patterson
Size ..... 12 by 22 ft.
Reduces Coal to ..... 1¼ in.
Drive ..... Motor and speed reducer
Magnetic Separators 2
Coal Preparation ..... Combustion Engineering Corp.
Type of System ..... Central
Present Capacity ..... 90 t. per hour
Type ..... Mill drying
Arrangement ..... One heater per mill
Heating Surface ..... 1260 sq. ft., each
Capacity of Air Fan ..... 7200 c.f.m. at 70 deg. F.
Mill and Exhauster ..... Raymond Bros.
Number 6
Capacity ..... 15 t. per hour
Type ..... Six-roll impact
Fineness .. 65 per cent through 200 mesh
Conveyors 4
Type ..... Screw, 16 in.
Capacity ..... 60 t. per hour
Transport Pumps 2
Type ..... Screw feed, 100 t. an hr.
Number Bunkers per boiler . 2, each 90 t.
Control ..... Bin indicator

Boilers and Accessories

Boilers ..... Babcock & Wilcox
Number 6
Type ..... Twin XXVI Special No. 55 Stirling
Size ..... 32,560 sq. ft., each
Steam Conditions ..... 400 lb. pressure, 725 deg. F., total temperature
Soot Blowers . Diamond Power Spec. Co.
Superheaters ..... Babcock & Wilcox
Number per boiler 2
Type ..... Convection
Surface—Total ..... 6778 sq. ft.
Economizers ..... Foster Wheeler Corp.
Number per boiler 2
Surface ..... 23,232 sq. ft. per boiler
Soot Blowers . Diamond Power Spec. Co.
Induced Draft Fans ..... B. F. Sturtevant Co.
Number per boiler 1
Type ..... Special 1011 Turbo Vane
Capacity ..... 327,000 c.f.m., 15 in. H_2O static pres.
Drive ..... 1500/300-hp., two-speed G.E. induction motor
Stacks ..... Wiederholdt Construction Co.
Number 3
Type ..... Reenforced tile concrete
Size ..... 17.5 by 175 ft.
Precipitators ..... Combustion Engineering Corp.
Type ..... Cottrell
Capacity ..... 128,500 c.f.m. at 250 per cent rating
Number ..... 6 (2 per stack)
Boiler and Furnace Settings ..... M. H. Detrick Co.
Arch ..... Detrick
Furnace ..... Air-cooled, Detrick suspension type
Furnace Volume ..... 32,560 cu. ft.
Firebrick ..... Chas. Taylor & Sons Co., Kier Firebrick Co., Cleveland Builders Supply & Brick Co.
Insulating Brick .... Armstrong Cork Co.
Refractory Bond .... J. A. Faulkner Co.
Constructed by .. Rust Engineering Co.
Firing Equipment ..... Combustion Engineering Corp.
Type ..... Vertical, two sides with pulverized fuel
No. Burners per side ..... 8 fan tail
No. Feeders per side ..... 4—5¼-in. duplex, type R
Drive ..... 2½/3½-hp., variable-speed, d.c. motor
No. Primary Air Fans ..... 2 per boiler
Capacity ..... 10,000 c.f.m., 20 in. H_2O static pres.
Secondary Air Supply ..... Bailey hollow wall dampers
Combustion Control ... Bailey Meter Co.
Water Screens ..... Combustion Engineering Corp.
Heating Surface ..... 980 sq. ft.
Ash Hoppers ..... Allen-Sherman-Hoff Co.
Type ..... Air cooled
Gates ..... Air operated
Ash Handling ..... Hydraulic sluice

Feed Pumps and Heaters

Boiler Feed Pumps ..... Lecourtenay Co.
Number 4
Characteristics ..... 1500 g.p.m. 500 lb. pressure at 2500 r.p.m.
Drive ..... Terry steam turbine
Open Heaters ..... Worthington Pump & Mach. Co.
Number Open Heaters 3
Type ..... Barometric jet condenser
Closed Heaters ..... Griscom-Russell Co.
Number and Surface ..... 3—1925 sq. ft. and 3—1462 sq. ft.
Drip Pumps ..... Lecourtenay Co.
Number 3
Size ..... 200 g.p.m. at 250 ft.

Turbine-Generators and Auxiliaries

Turbine-Generators . General Electric Co.
Number 3
Capacity ..... 50,000 kw. at 80 per cent power factor
Type ..... 17-stage impulse, 1800 r.p.m.
Steam Conditions ..... 375 lb. gage, 700 deg. F.
Generator Air Coolers ..... General Electric Co.
Number ..... 1 per generator
Size ..... 18,000 sq. ft. each, 6 section
Condensers ..... Worthington Pump & Machinery Corp.
Number ..... 3 (1 per turbine)
Type ..... Surface, single pass
Surface ..... 57,000 sq. ft.
Tubes ..... Chase Brass & Copper Co.
Circulating Pumps ..... Worthington
Number ..... 6 (2 per condenser)
Type ..... 48 in. centrifugal
Capacity ..... 63,000 g.p.m.
Drive ..... 1 motor and 1 duplex
Condensate Pumps ..... Worthington
Number ..... 6 (2 per condenser)
Type ..... 8 in. 3 stage centrifugal
Capacity ..... 1200 g.p.m.
Drive .... 1 motor and 1 duplex
Air Pumps ..... Worthington
Number ..... 3 (1 per condenser)
Type ..... Steam jet, inter and after condensers
Number of Stages 2
Capacity .. 12½ c.f.m. at 1 in. absolute
Intake Screens ..... Chain Belt Co.
Number 6
Size ..... 9 ft. 6 in. by 22 ft. 0 in.
Traveling Cranes ..... Cleveland Crane & Engineering Co.
Turbine Room ..... Span 97 ft.
Capacity Main Hook ..... 125 t.
Transformer Repair House .. Span 35 ft.
Capacity Main Hook ..... 90 t.
Elevators ..... Otis Elevator Co.
Switch House Capacity ..... 6000 lb.
Boiler Room Capacity ..... 1—6000 lb., 1—4000 lb.

Miscellaneous Pumps

Service Water ..... Lecourtenay Co.
Number 4
Capacity ..... 2000 g.p.m. at 110 lb. pressure
Drive ..... 2 motor and 2 turbine
Ash Sluice Water Pump . Lecourtenay Co.
Number 2
Capacity ..... 3000 g.p.m. at 165 lb. pressure
Condenser Cleaning .... Lecourtenay Co.
Number 1
Capacity .... 500 g.p.m., 350 lb. pressure
Screen House ..... Lecourtenay Co.
Number 1
Capacity .... 500 g.p.m., 100 lb. pressure
Air Compressor ..... Ingersoll-Rand Co.
Number 2
Type ..... Horizontal compound
Capacity ... 1100 c.f.m., 110 lb. pressure
Drive ..... 225-hp. synchronous motor

Other Mechanical Equipment

Valves
Boiler Non-Return ..... Foster Engineering Co.
Blowoff ..... Yarnall-Waring Co.
Hydraulic Circulating ..... Chapman Valve Mfg. Co.
Strainers for House Pumps . Elliott Co.
High-Pressure Gate ..... Chapman Valve Mfg. Co.
High-Pressure Globe ..... The Edward Valve & Mfg. Co., Consolidated Ashcraft Hancock Co.
Standard Gate and Globe ..... Crane Co., Consolidated Ashcraft Hancock Co., Chapman Valve Mfg. Co. Lunkenheimer Co.
Reducing ..... Foster Engineering Co.
Atmospheric Relief ..... Cochrane Corp.
Boiler Safety ..... Consolidated
Throttle Trip ..... The Schutte & Koerting Co.
High-Pressure Traps ..... Armstrong Machine Works
Low-Pressure Traps ... C. E. Squires Co.
Piping .... Pittsburgh Piping & Equip. Co.
Pipe Covering ..... Johns-Manville, Inc.
Recorders and Meters ..... Bailey Meter Co., Foxboro Co., Builders Iron Foundry
Thermometers ... Taylor Instrument Cos.
Master Clock System ..... International Time Recording Co.
General Contractor ..... Hunkin-Conkey Construction Co.
Steel ..... American Bridge Co.
Steel Erection .... Bass Construction Co.
Marine Work ..... Great Lakes Dredge & Dock Co.

Electrical Equipment

Generators: Three 50,000 kw., 0.8 p.f., 62,500 kv-a., 60 cycle, 13,800 v., three phase, General Electric units, with direct-connected exciters.

Main Oil Circuit Breakers: Twenty-one G.E. Co. type FHD-21, 3 pole breakers, 15,000 v., 400 amp. Rupturing capacity 50,000 amp. at 13,200 v. Six as above except of 600 amp. rating. Four G.E. Co. type FHKO-139, 3 pole, 132,000 v., 600 amp., outdoor breakers; rupturing capacity 6500 amp. at 132,000 v.

Neutral and Grounding Breakers: Five conduit type F-11, 15,000 v., 1200 amp.

Station Power Oil Circuit Breakers: (Contained in Westinghouse 2300-v. truck type switchboards.)

Station Power Air Circuit Breakers: (Contained in main 440-v. distribution group assembled by I.T.E. Circuit Breaker Co.)

Motor-Generator Sets. One 300-kw. dual drive Terry Turbine—Allis-Chalmers set. One 200-kw. dual drive set. One 200-kw. single-drive Allis-Chalmers M.G. set.

Motor-Generator Sets. (For control supply.) Rochester Elec. Products Co.

Balancer Sets. (For maintaining a neutral on 250-v. d.c. system.) Two 125/250-v., 200-amp. Westinghouse sets.

Step-Up Transformers: (For supplying transmission lines.) Three banks, 13,200 v. delta to 138,000 v. Y, each made up of three 20,000-kv-a., self-cooled, single-phase General Electric units.

Station Service Transformers: Westinghouse Electric & Mfg. Co.

Indoor Disconnecting Switches: Champion Switch Co.

Outdoor Disconnecting, Load Break and Grounding Switches: Railway & Industrial Engineering Co.

Indoor Bus Bar Supports: Railway & Industrial Engineering Co.

Main Current and Potential Transformers: General Electric Co.

Potential Transformer Fuses: Schweitzer & Conrad resistor type mountings with type DLC fuses.

Reactors: Twenty-four, 3000 amp., 1440 kv-a., single phase, G.E. type CLS.

Storage Batteries: Electric Storage Battery Co.

Control Boards: Ebony asbestos panels with type AD indicating meters; furnished by General Electric Co.; bench type for generators, vertical type for feeders.

Truck Type Switchboards: Westinghouse Electric & Manufacturing Co.

Direct-Current and Lighting Switchboards: Built by Powerlite Switchboard Co., using I.T.E. circuit breakers.

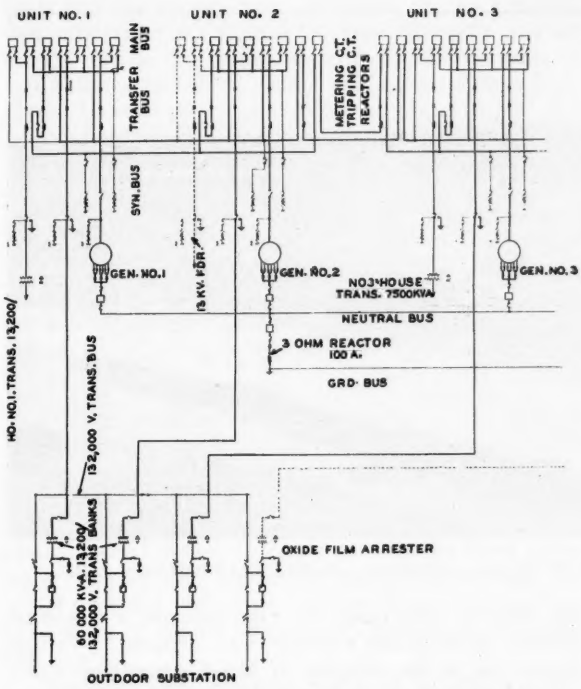


FIG. 6. WIRING DIAGRAM OF MAIN ELECTRICAL CIRCUITS

Pulverized coal flows from the overhead bunkers to the fuel feeders where it mixes with the primary air and is then blown into the boiler furnace through vertical fan tail burners. There are 16 of these burners to each furnace, eight on a side, the fuel being to the burner by four duplex feeders on each side. Two primary air fans serve each boiler; each fan has a capacity of 10,000

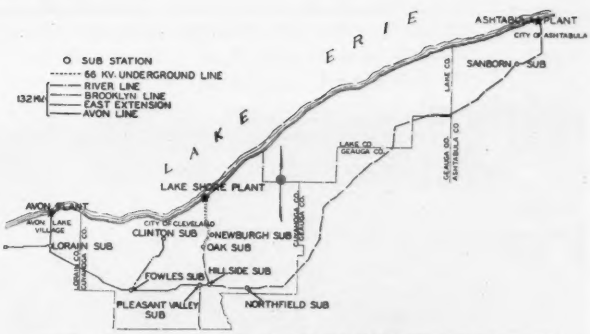


FIG. 7. GENERAL PLAN OF TRANSMISSION SYSTEM

c.f.m. at 20 in. static pressure and is driven by 75 hp., 2200-v. induction motors.

Coal Handling System

The company's tracks connect with railroad trunk lines over which coal is received from the coal fields to the southward. Provision has been made for storing 225,000 t. of coal, with a 285-ft. bridge to serve the storage pile. Standard railroad cars of coal after being weighed are dumped into a receiving hopper by a 52-ft. rotary car dumper with a capacity of 20 cars an hour. Provision is also made for unloading by hand into the same hopper. From the hopper a conveyor belt carries the coal to a coal breaker where it is reduced to 1¼-in. size. This breaker is provided with a bypass for slack coal. Leaving the breaker, the coal is carried over magnetic separators and is then sent on a conveyor belt to the top of the preparation house. Here it passes under a magnet and is then transferred to the long distributor belt run the entire length of the building over the green coal bunkers. All coal handling machinery is designed

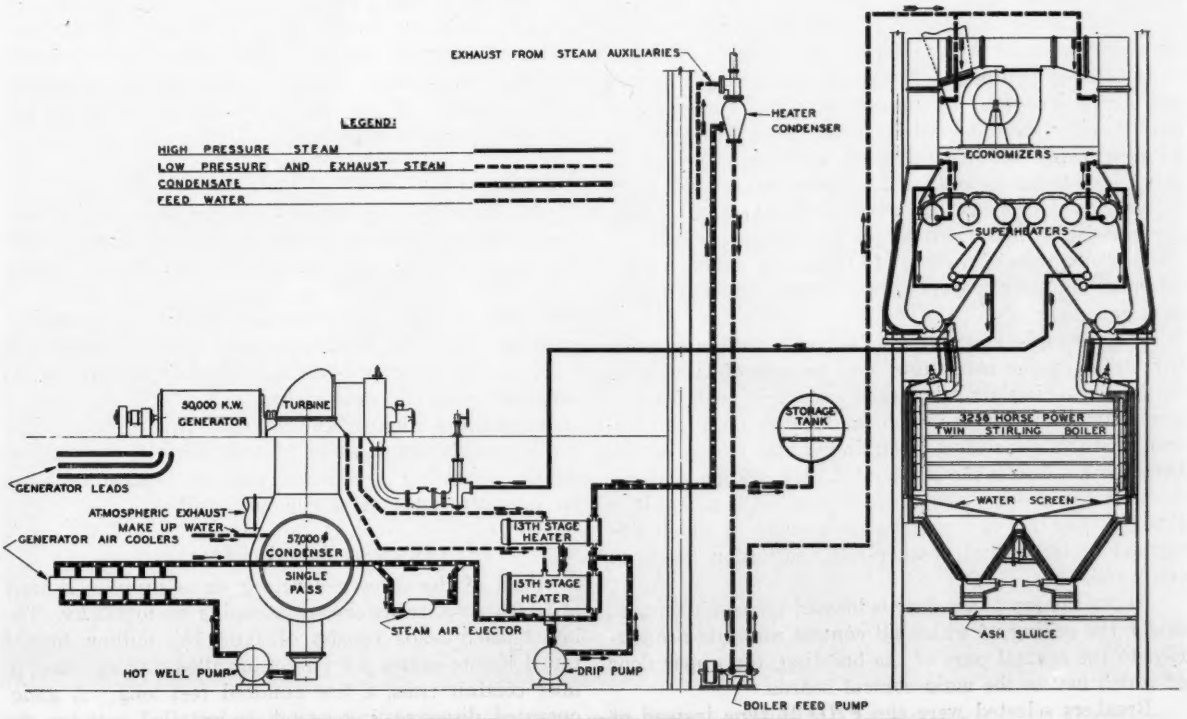


FIG. 8. STEAM, CONDENSATE AND FEEDWATER CIRCUITS AT ASHTABULA

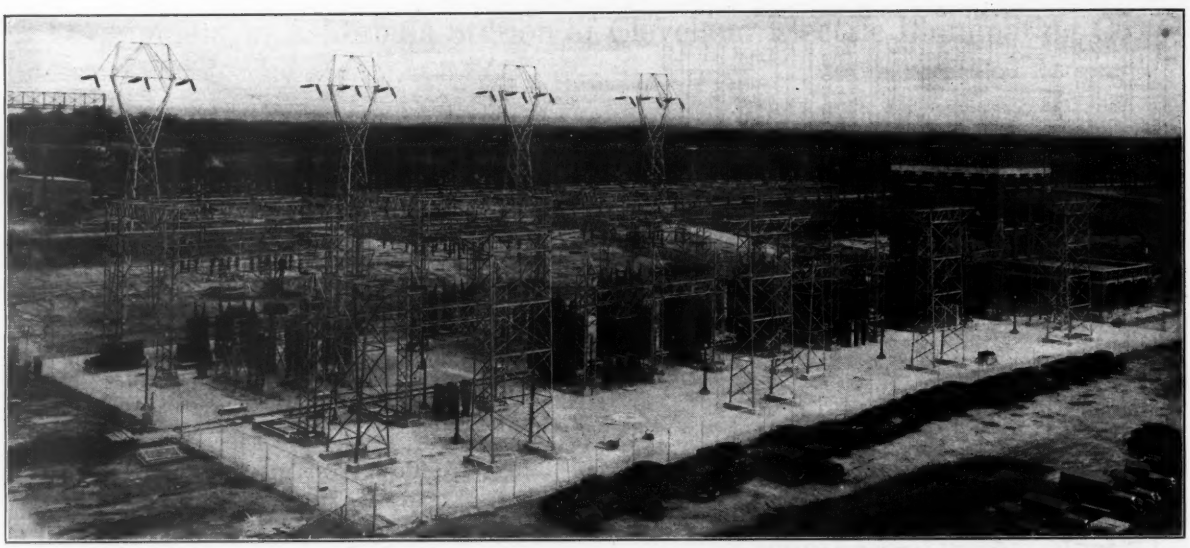


FIG. 9. TRANSFORMER YARD AND SERVICE HOUSE, SHOWING OUTGOING 132-KV. TRANSMISSION LINE

to handle 350 t. an hour. Figure 4 shows diagrammatically the operation of this coal handling system.

Switch House

At Ashtabula electrical design, like the mechanical, follows closely that of the Avon plant. The switch house immediately adjoins the turbine house and will consist, when completely developed, of two four-story wings and a five-story central section, with a basement (mezzanine) and sub-basement. Directly adjacent to and south of this central section is a six-story and basement office section.

Phase Floors

Each switch house wing will house the equipment for four generators. The phase floors are divided into sections, there being one section for the equipment required for each generator and its associated circuits. The sections housing equipment for generators 1 and 2 and 3 and 4 are separated by passageways but between sections 2 and 3 there is located on each floor an inspection room provided with a steel master-cell for adjusting all breaker units before rolling into place, together with the necessary chain hoists, lift trucks, oil sinks and oil supply and drain lines required for maintenance work.

Sections themselves are divided into three rooms; there are thus nine rooms on three floors associated with each generator.

A system of air ducts extends from a fresh air intake with filter on the mezzanine floor to each of these nine rooms, delivering air below each reactor in each breaker compartment and to the mechanism room. Another system of ducts connected to an individual two-speed exhauster fan draws the air out of each section and delivers it out-of-doors above the switch house roof. It is thought that this is the first switch house in which this method of individual breaker cell ventilation has been employed.

Above the top phase floor is located the conduit room, under the ceiling of which all control conduits are carried to the central part of the building, the upper floor of which houses the main control boards.

Breakers selected were the FHD-21 type instead of the FHD-17 type used at Avon because a somewhat greater interrupting capacity was required. Various factors led to the selection of MK-4 centrifugal motor type of mechanism, each pole being equipped with its own individual one and all mechanical connections between poles omitted. There results a three-phase breaker having three independently operated poles, electrically inter-connected only, with but a single linkage between each mechanism and its breaker element.

Main 13-kv. connections duplicate the Avon scheme in general. The one line diagram is shown in Fig. 6.

Generators

Generators are rated 50,000-kw., 62,500 kv-a., 13,800 v., 3 phase, 60 cycle, 1800 r.p.m. They will deliver full rated kv-a. at any voltage between 95 and 105 per cent of rated terminal voltage. Their other characteristics are about as follows: Short circuit ratio, 0.9; sub-transient reactance, 12 per cent; transient reactance, 21 per cent; synchronous reactance, 115 per cent.

Miscellaneous Indoor Features

All disconnecting switches are gang-operated, except those used for isolating synchronizing tie reactors from the synchronizing bus (which disconnects are opened only when maintenance on these reactors is required) and the potential transformer circuit disconnecting switches. Suitable mechanical and electrical interlocks are provided between breakers and their disconnects to safeguard men and equipment. Tell-tales in the breaker aisles indicate whether the disconnecting switches of a given breaker are open or closed. This is essential as the disconnecting switch cells and the breaker cells are on opposite sides of a common wall.

Outdoor Step-Up Station

Each of the three generating units supplies a bank of 60,000-kv-a. transformers, stepping up to 132 kv. The low tension leads consist of four 1½ million bronze taped Kerite cables per phase, installed underground in fiber conduit runs, a few hundred feet long. A gang-operated disconnecting switch is installed between the

leads and the transformer. Breakers on the high-tension side are of the FHKO-139 type, 400-amp., 138-kv. rating. These are provided with bypass switches to facilitate maintenance. Oxide film arresters have been placed between the breakers and the transformers, and in addition flash-gaps have been installed.

It will be noted that the generators, transformers and lines are operated as units, paralleling being done on the low-tension side of step-up and step-down transformers only.

Transformer units are of the non-resonating (shielded) type, nominal ratio 13,200 to 138,000 v., and are provided with one 2½ per cent tap above two 2½ per cent taps below normal on high-voltage side.

Station Power

Station power is obtained through house service transformers, a bank of 14,500/2300 v., 4500-kv-a. self-cooled/7500-kv-a. self and water-cooled being installed for every two units. These transformers feed independent sections of a truck type board, installed on the mezzanine floor of the switch house, the sections being physically isolated and electrically connected through tie cables provided with a tie breaker at each end so that the failure of one tie breaker will not involve an adjacent section.

Secondary boards supply power to the boiler auxiliaries and to the coal preparation equipment. The duplicate auxiliaries of the generators are cross-connected, one set feeding from one section and the other from another section. This facilitates switchboard maintenance and improves reliability. The secondary switchboards supplying the boiler groups and fuel preparation equipment are supplied from two sources through interlocked breakers, thus preventing paralleling the supply circuits.

In general, motors above 40 hp. are supplied at 2300 v., exceptions being made for some of the coal handling motors exposed to large quantities of dust and moisture. The 440-v. supply is obtained from two 600-kv-a., 2300/460-v., three-phase transformers fed from the main switchboards. These in turn are led into a metal-clad urelite switchboard with removable units. This board is designed for an ultimate of three transformers (one being a spare), and is normally operated sectionalized. The sections are isolated by gas-tight bushings and steel plates. Lighting is supplied by two 333-kv-a., 2300/115-230-v., three-wire transformers. Direct current for fuel feeder motors, switch house ventilating fans, and all elevators, comes from motor-generator sets, two of which are dual driven. Two 125/250-v. balancer sets establish a neutral so that the d.c. system may be available for emergency lighting in case of failure of the a.c. supply. Control power is provided by two diverter-pole motor-generator sets and two 60-cell storage batteries. The batteries float on the control bus at switch charge, but the motor-generator sets each have capacity enough to fully charge a battery, if required.

In case of failure of the a.c. supply, the steam drives pick up all load on dual-driven sets, a portion of the lighting is transferred automatically to d.c. service and steam jets take the place of the primary air fans.

If only a partial failure exists, throw-over to the reserve circuits in the case of boiler plant auxiliaries or to the reserve units in the case of turbine auxiliaries restores normal conditions. Experience at Avon, coupled with a careful study of the various causes of alternating-current interruptions, indicates that a complete shut-down from alternating-current supply failure is practically impossible.

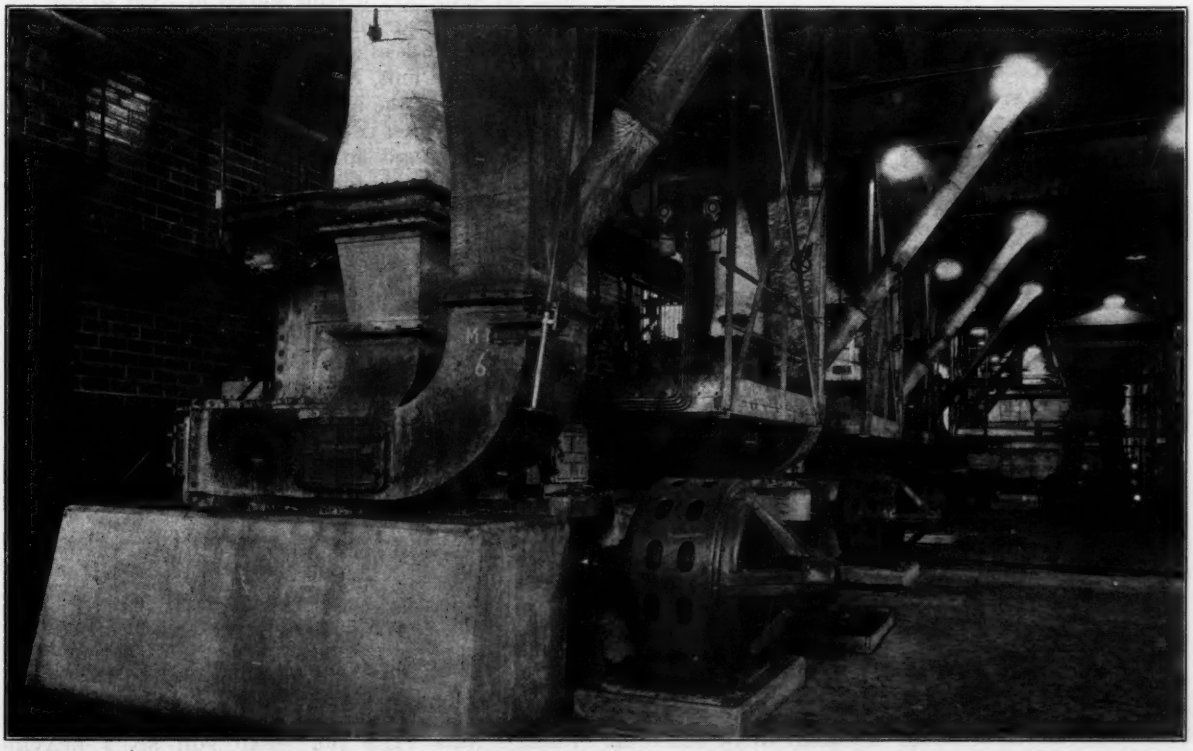


FIG. 10. COAL PULVERIZING MILLS, 15 T. AN HOUR CAPACITY EACH. AT RIGHT ARE THE TWO COAL TRANSPORT PUMPS

Steam and Water Control Equipment

Piping, Piping Tools, Joints, Expansion Joints, Gaskets, Packing, Insulation Gages, Thermometers, Meters and Traps

STATEMENT BY THE AMERICAN PIPE BENDING MACHINE CO., BOSTON, MASS.

TWO NEW TYPES of cold pipe bending machines have recently been perfected by the American Pipe Bending Machine Co., Inc. The first is the type A-30 stationary conduit and pipe bender for bending all sizes from ½ to 2 in. The second machine is the Wonder hydraulic power cold pipe bender so designed that one man can bend all sizes of steel, wrought iron, brass and copper pipe up to 4 in. easily and quickly. This model is portable, can be moved anywhere by one man and is especially designed for use by electrical contractors and big industrial plants.

STATEMENT BY THE BORDEN CO., WARREN, O.

During the past year the Borden Co. has expanded and improved its entire line of Beaver tools. In reorganizing the Beaver line, simplicity, ruggedness, convenience and low price were the main consideration.

One of these new tools is the four-post die stock for threading 1, 1¼, 1½ and 2-in. pipe. The tool is made both plain (No. 8) and ratchet (No. 8-R) and in spite of the heavier parts and greater strength, the new tools are lighter than the old ones, the new Beaver No. 8-R being 3 lb. lighter than the old style four-post ratchet die stocks which it replaces.

The new No. 104 Beaver square-end pipe cutter is a simple, strong and encased tool with no loose parts except a wrench furnished for tightening up the V jaws and knives. If this wrench is lost, any wrench can be used with the tool. It is built for standard, extra heavy or double extra heavy 2½-in. to 4-in. pipe and is fitted with the stationary driving pinion in front so that the tool can be used interchangeably with the No. 41-E Beaver Die Stock in connection with a power drive.

This latter unit, No. 41-E Beaver Die Stock, is an improvement of the No. 41 Beaver die stock which has been on the market twenty years. This new tool has the gear fully encased and packed in graphite grease so that it is impossible for dirt, sand, mud, chips or other foreign matter to get in the gear case and wedge between the gear and pinion teeth. Gear cases are made of very special grade of nickel semi-steel instead of cast iron and the lower end of the pinion rides in a bronze-bushing.

To satisfy the demand for power drive that could be used on either a.c. or d.c. and which will reverse, the

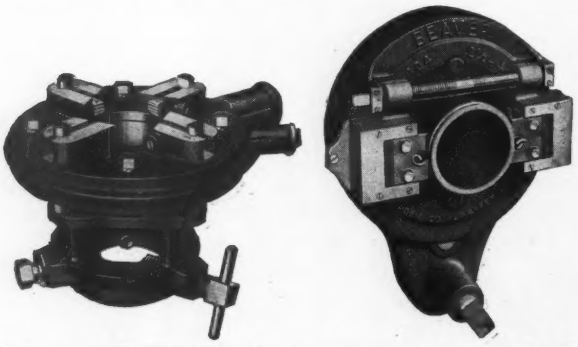


FIG. 1. THE BORDEN CO., NO. 8-B 4-POST DIE STOCK (LEFT) AND THE NEW NO. 104 BEAVER SQUARE END PIPE CUTTER (RIGHT)

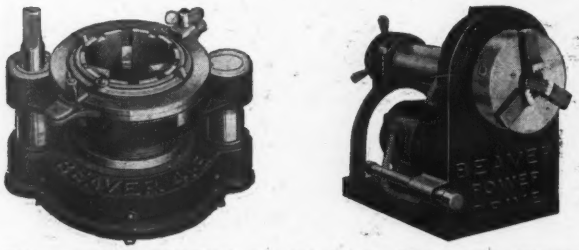


FIG. 2. THE BORDEN CO. NO. 41-E GEAR DIE STOCK SHOWING THE NEW FULLY ENCASED GEAR FEATURE (LEFT) AND THE BEAVER POWER DRIVE (RIGHT)

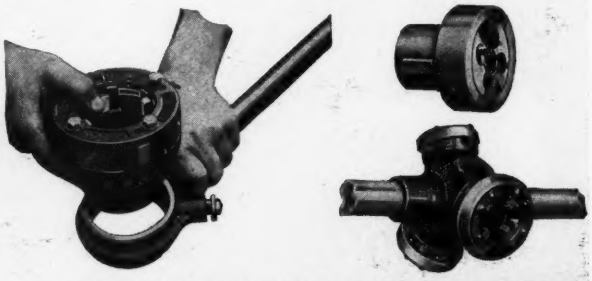


FIG. 3. NEW BORDEN CO. TOOLS: BEAVER NO. 17 RATCHET DIE STOCK (LEFT); BEAVER 3-WAY DIE STOCK (BELOW, RIGHT); NEW TYPE DIE HEAD FOR NO. 3 BEAVER RATCHET DIE STOCK (ABOVE, RIGHT)

No. 46 Beaver power drive has been designed. This is a simple, fool-proof rugged machine which will stand a tremendous amount of abuse and taken with No. 104 and No. 41-E makes an ideal combination for cutting and threading 2½ to 4-in. pipe.

Beaver No. 17 ratchet die stock threads ½, ¾, 1, 1¼, 1½ and 2-in. pipe, using a separate head for each size. This tool is an excellent accessory to the Beaver power drive. The new Beaver 3-way die stock are companion tools of the No. 3 Beaver hatchet. Die stocks and dies of the new 3-way and the No. 3 are interchangeable. Of the new 3-ways No. 33 threads ⅜, ½ and ¾-in. and No. 34 threads ½, ¾ and 1-in. pipe. New type die heads for No. 3 Beaver ratchet die stock run from ⅛ to 1 in. and openings are provided between the dies for easy oiling and chip clearance and to allow the oil to flow directly to the throat of the dies where it is needed.

With a cutting range of ⅛ to 2 in., the new Beaver No. 102 Wheel Cutter can be used as a one or three-wheel cutter. Castings are of malleable iron and the thin cutter wheels are of a special grade of alloy steel. An extra long threaded barrel, plus a large comfortable handle for gripping enables the operator to make a quick cut with a practically burrless end.

Statement by The Brown Instrument Co., Philadelphia, Pa.

Developments by The Brown Instrument Co. during 1930 include the following:

Model No. 252 manometer. Used with the Brown electric flow meter for measuring the flow of gas or air where the pressure does not exceed 50 lb. per sq. in., designed to operate on flows developing pressure differentials as low as 2.53 in. of water.

Model No. 255 manometer. This is a high-pressure manometer capable of measuring flows under conditions where the manometer must withstand pressures up to 5000 lb. per sq. in. It is of interest in applications where very high steam pressures are developed, or for industrial process applications involving extreme pressures. Used with the Brown electric flow meters for measuring steam, water, gas, air, oil or other fluids.

Model No. 7501 remote type pressure gage. This instrument operates by means of a tubular helix which opens and closes with pressure changes, this motion causing an armature to rise and fall in an inductance bridge coil. An indicating or recording instrument contains a similar coil armature which follows the movements of the armature in the transmitter. Thus, the receiving instrument indicates or records the pressure changes actuating the transmitting instrument. The latter may itself perform the function of an indicating instrument as well as a transmitter by being equipped with a dial and pointer, the latter being directly operated by the movement of the helix through a suitable link motion. By means of this instrument, pressure changes may be transmitted over distances as great as 30 mi., and be accurately indicated or recorded by the receiving meter.

De Florez remote manual control. This equipment consists of a transmitting mechanism and a receiving mechanism, both equipped with Selsyn motors. The transmitter motor rotor is turned manually, this motion being duplicated in the receiving motor. Thus, the receiving mechanism may be applied to open or close a valve, gate or perform a great variety of functions, under the direct manual control of the operator actuating the remote transmitting mechanism.

The transmitter is equipped with a dial and pointer by means of which the position of the device operated by the receiving mechanism is indicated. Thus, for example, a distant valve can be set to any desired position, the changes in the setting of the valve being manually effected by the remote operator, who at the same time can observe the changes in the position of the valve setting by means of the indicating device. Since the manual effort of the operator is actually transmitted, he is able to "feel" the movement of the valve and thus detect any unusual condition.

In oil refineries and elsewhere, application of this device is saving many thousands of dollars by making it unnecessary to go to great expense to bring piping to a central point.

Model No. 801 indicating controller. This instrument is an improved indicating meter of the automatic control type. It can be supplied as an indicating automatic control pyrometer, resistance thermometer or tachometer. It operates with mercury switches of 30 amp. capacity, eliminating the necessity of relaying equipment. The control point is easily adjustable. Internal resistance insures accuracy.

When supplied as a pyrometer, the instrument is equipped with Brown automatic internal compensation, eliminating cold junction errors. The instrument is of sturdy design and construction making it very suitable for general industrial use.

Statement by The Builders Iron Foundry, Providence, R. I.

Developments during 1930, by the Builders Iron Foundry in the line of Venturi metering equipment for the power field have been concerned largely with developments in Venturi tubes and Venturi registers for high-pressure boiler feed lines in central station power plants. A number of installations have been made during the year ranging from 600 up to 1625 lb. pressure.

Statement by The Philip Carey Co., Cincinnati, O.

During the year 1930, The Philip Carey Co. has developed a group of heat insulating materials of a semi-refractory type for use under high-temperature conditions, up to 2500 and 3000 deg. F., such as found in boiler settings, high-temperature ducts, breechings, stacks, industrial furnaces, annealing ovens, lehrs, blast furnace stoves, regenerator chambers and tunnel kilns.

This group of high-temperature heat insulating materials consists of the following:

Carey Rock Wool Blankets. A novel and much improved type of rock wool blanket or sheet, consisting of felted rock wool fastened between various types of metal fabric. The sheets or blankets are 2 ft. wide by either 4 or 8 ft. long, flexible, suitable for temperatures up to 1200 deg. F., and particularly applicable to large surfaces such as tanks, stills or ducts.

Carey Dicalite Insulating Powder. Dicalite Insulating Powders, fine, coarse and calcined aggregate, are an unusually fine and light form of diatomaceous earth. The fine and coarse powders are used for dry packing between walls and can be subjected to temperatures up

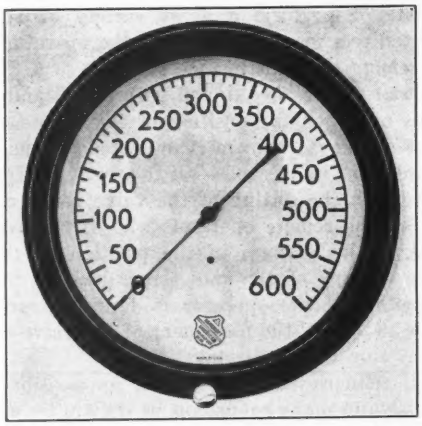


FIG. 4. DURAGAUGE, THE NEW DESIGN OF THE CONSOLIDATED ASHCROFT HANCOCK CO.

to 1500 deg. F. With a slight admixture of asbestos fibre, clay or Portland cement, they produce plastic insulating cements of remarkable heat insulating value. Dicalite calcined aggregate is a coarse calcined product which can be mixed with portland cement in the proportion of four parts of dicalite calcined aggregate to one part of portland cement, by volume, to form an insulating concrete for the floors of furnaces and ovens. Dicalite calcined aggregate is unaffected up to 2200 deg. F.

Carey Alumino-Hi-Temp. This new product, the company considers, is not only the most outstanding development in the heat insulation field during the year 1930 but represents an advance in the art of heat insulation comparable to that when asbestos was introduced into the insulation field. Carey Alumino-Hi-Temp, in the form of large blocks, 9 in. wide by 36 in. long, or in the form of standard size brick, 2½ by 4½ by 9 in., can be applied to all types of metal and brick structures where heat insulation is required for internal temperatures ranging up to 2500 or 3000 deg. F.

It has a combination of characteristics, such as unusual heat insulating value, high temperature resistance, extremely small heat expansion, minimum heat shrinkage, substantial mechanical strength and low heat storage capacity that make it unusually desirable as a high-temperature heat insulating material. It is a radical departure from previous practice in that it is a special form of alumina derived from bauxite whereas previous high-temperature insulations have practically all been some form of silicate.

Statement by The Consolidated Ashcroft Hancock Co., Inc., Bridgeport, Conn.

Most important of the developments of the Consolidated Ashcroft Hancock Co., Inc., during 1930 was the American Ashcroft Duragauge. Particularly since the advent of high pressures and high temperatures with the corresponding severe service, for instance, on turbine work where vibrations and pulsations are prevalent there has been a demand for a durable and accurate pressure gage to withstand this abnormal strain. In power plant practice the demand is for a gage which can be flush mounted for ordinary wall mounting as well as flush mounting with an illuminated dial.

For the Duragauge, a special movement of nitralloy steel and spring bored out of special solid steel alloy were developed. Expansion and contraction of these springs are absolutely uniform throughout the entire range and make possible uniform graduations of the dial on a gage so accurate that test gage accuracy of ½ of 1 per cent can be guaranteed.

Sockets are made of forged steel, the cases are die-cast and usually furnished with black, hard rubber finish that are made absolutely waterproof. Another important feature is the unique pointer hand which has an integral micrometer adjustment which makes it simple to compensate the gage for a water leg in the piping. With this design and construction, the life of the Duragauge is increased several fold and is unconditionally guaranteed for 5 yr.

Statement by The Crandall Packing Co., Palmyra, N. Y.

For the last year, the Crandall Packing Co. has to a certain extent centered its activity on the packing lubricant Luball, an emulsified metal which lubricates packings, including sheet and gaskets and prevent corrosion of metal. It has the consistency of lard and is as easily applied as any grease. It is unaffected by heat, will not cook out of packing, is unaffected by the washing action of liquid either hot or cold and is impervious to weather exposure.

Statement by The Croll-Reynolds Eng. Co., New York, N. Y.

The Croll-Reynolds Eng. Co. has placed on the market the FlexoDisc expansion joint, an entirely new type of expansion joint for pipe lines.

This joint permits free movement of the piping without strain through the use of a flexible heat treated nickel steel expansion element, welded to cast-steel flanged heads which are guided relative to each other to permit longitudinal movement only. A special design is offered where lateral or angular misalinement must be provided for.

The expansion element is a completely welded assembly of corrugated nickel steel discs. After welding, which is done by the General Electric atomic hydrogen process, the complete element is heat treated to obtain uniform quality, maximum strength, and freedom from all local stresses due to welding. This construction, requiring no packing, is absolutely leakproof.

In operation, the movement of the FlexoDisc expan-

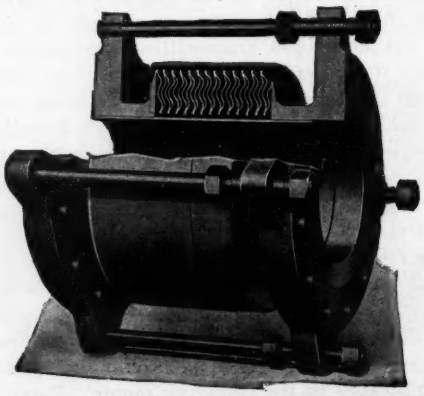


FIG. 5. THE STANDARD TYPE FLEXODISC EXPANSION JOINT OF THE CROLL-REYNOLDS ENGINEERING CO.

sion joint is analogous to the action of a coil spring, in that the element takes up the expansion and contraction of the piping by the elastic deflection of the plates. Therefore, since the stresses are entirely within the elastic limit, the life of the element is practically unlimited.

This new expansion joint is now available in various types suitable for working pressures up to 50, 125, or 250 lb. with either flanged or welding ends. Larger sizes and types for higher pressures will soon be offered.

Where corrosion is important, stainless steel construction is used. Thus, this expansion joint is adaptable for pipe lines handling corrosive liquids, gases, or vapors as well as ordinary fluids.

Statement by The Crosby Steam Gauge & Valve Co., Boston, Mass.

Crosby all-steel pressure gage has just been announced by the Crosby Steam Gauge & Valve Co. Some of the features are: a forged steel socket with the movement carried on an integral extension of the socket independent of the case; the movement is of all-steel, nickel-plated; the sector and pinion are of forged steel, case hardened; the tube is of steel, with forged steel tip and link; the gage is designed for extreme service of temperature and vibration and is guaranteed to retain its accuracy under such conditions.

Statement by The Durabla Mfg. Co., New York, N. Y.

In connection with high-pressure and high-temperature work a new development pertaining to the use of highly compressed asbestos fibre gaskets has recently been introduced by the Durabla Manufacturing Co.

Exhaustive tests of Durabla Gaskets, made during the summer of 1930, prove that these gaskets can be used to advantage on all pipe joints covered by Series 150 to 1500 lb., provided they are properly proportioned as to size and thickness. All gaskets used during these tests were proportioned in accordance with a formula known as the Durabla Formula.

Proper proportioned gaskets for the above mentioned series, that is, gaskets designed for high gasket pressure and comparative low bolt stresses are listed in a new catalog, now in the printing, and range in thicknesses from 1/64 in. for the 1500 lb. series to $\frac{1}{16}$ in. thick for the 150 lb. series. Certain sizes and thicknesses of these gaskets are provided with a reinforcing ring (patent applied for) for the purpose of handling them more conveniently.

All reënforcing rings are $\frac{1}{16}$ in. thick and the inside diameter is $\frac{1}{8}$ in. larger than the outside diameter of the raised face thus forming a shoulder for centering the gasket. Owing to the characteristics of the Durabla Gaskets, they become fireproof during the first "warming up" period of the piping. The importance of this cannot be overestimated.

Another reason for using Durabla Gaskets for high pressures and high temperatures is the fact, proved by the aforementioned tests, that the cushioning effect obtained with the asbestos fibre gasket relieves the bolts of excessive strain due to unequal expansion of pipe and flanges and so insures a tight joint at all times. Durabla Gaskets can be used for any temperature for which the piping system is designed.

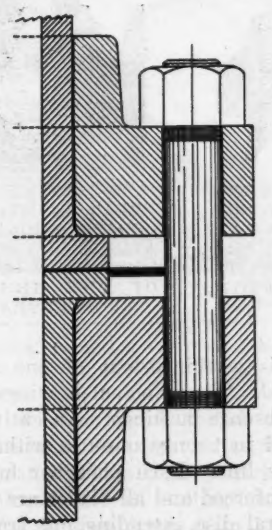


FIG. 6. SHOWING THE METHOD OF INSTALLING THE NEW DURABLA MFG. CO. REINFORCED GASKET

Statement by The Flexitallic Gasket Co., Camden, N. J.

During the year 1930, the Flexitallic Gasket Co. developed its new reënforced gasket for pressures up to 2000 lb. per sq. in. and the Armour Clad Flexitallic type for boiler hand holes, superheaters, economizers and boiler connections. Both of these gaskets have met with the approval of engineers interested in high pressures and they have been used throughout in two of the highest pressure plants in the United States.

These new developments of the Flexitallic Gasket Co. retain the V-shaped center of the regular Flexitallic gasket, therefore they have the same resiliency to take care of expansion and contraction.

Statement by The Foxboro Co., Foxboro, Mass.

Foxboro Co. has added to its instruments a line of new steel spring indicating and recording gages. A special alloy chrome-molybdenum steel is used for the bourdon and helical springs of these gages and all parts subject to pressure are of steel. No solder nor brass is used in the movements of these instruments which are designed as a super-gauge to fit modern conditions demanding uninterrupted service. The new indicating gage has the new type pointer with hair line indicator which makes possible more accurate readings while the

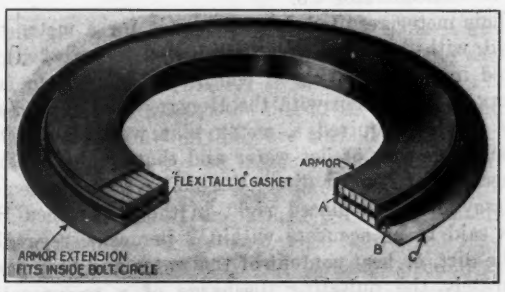


FIG. 7. AN ARMOR CLAD GASKET OF THE FLEXITALLIC GASKET CO.

new recording gage movement is of all-steel, all-welded construction.

This company has also brought out during the past year a new high-pressure recording flow meter and flow controller. The new instruments are built for operating pressures of 2500 lb. per sq. in. and serve as companions to the previously announced Foxboro high-pressure flow meters and flow controllers for 5000 lb. pressure applications.

Photograph shows a single pen 2500-lb. recording flow controller. If static readings are needed, a two-pen instrument with static element is furnished. When total flow readings are desired, an integrator is supplied. The integrator is a Foxboro product and gives flow readings direct without the use of multipliers.

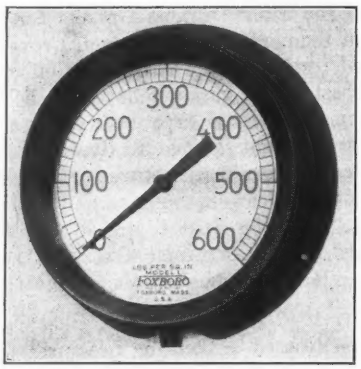


FIG. 8. NEW GAGE AND STEEL HELICAL GAGE MOVEMENT OF THE FOXBORO CO.

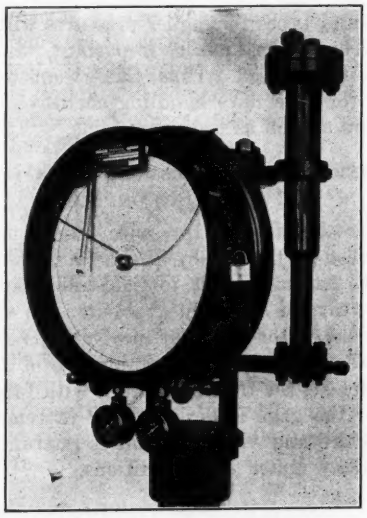


FIG. 9. ONE OF THE FOXBORO CO.'S 2500-LB. FLOW CONTROLLERS

Statement by The General Fittings Co., Providence, R. I.

Nuseal pipe union is a development of the General Fittings Co., during the past year. The special asbestos composition seat eliminates leakage in unions due to nicks and other defects and the resilient asbestos seat allows Nuseal unions to be broken and made up again repeatedly as a perfect joint each time the union is assembled. Actual tests have proved these unions are suitable for air up to 250 lb. pressure, steam up to 250 lb., 700 deg. F. and hot or cold water up to 250 lb. pressure.

Statement by The Henszey De-Concentrator Co., Watertown, Wis.

The newly designed Henszey, Vortex Type, Water Meter has just been placed on the market by the Henszey De-Concentrator Co.

This meter resulted from demands for a meter that would withstand the great strains, dirt and heat involved in the measuring of continuous blow-down from boilers in connection with the Henszey De-Concentrator This service required a meter that would accurately measure the flow of hot water and that would not stick on account of heat or dirt. For boiler feed service, the Henszey meter is placed right in the boiler feed line. It is said to be accurate within 2 per cent, regardless of the dirt, or heat content of the water and to measure accurately the pulsating discharge of a reciprocating pump.

The Henszey Vortex Principle (Pat. App. for) makes this possible. The water enters the measuring chamber tangentially and spins in the chamber as it passes through, forming a vortex. Each gallon that passes through makes the same number of revolutions of the vortex. A vane is placed in the rotating water to impart this rotation to the register. It is not necessary for the entering water to forcibly strike the vane. It simply turns with the vortex. The illustration shows the rotating vane in the upper part of the measuring chamber. Note the large clearance. There is no chance of sticking on account of heat or dirt. Particles as large as roofing gravel can pass through harmlessly.

The body is made of special bronze. Each of the transmission shafts, including its pinion, collars and thrust flange is machined out of one solid piece of Allegheny metal. The principal bearings have replaceable phosphor bronze bushings. An entire set of parts can be replaced in twenty minutes without taking the meter from the line. Each phosphor bronze blade of the vane is reënforced and all blades are rigidly braced by a thin central disc extending out from the hub of the vane.

FIG. 10. THE NU-SEAL UNION OF THE GENERAL FITTINGS CO. HAS AN ASBESTOS COMPOSITION SEAT

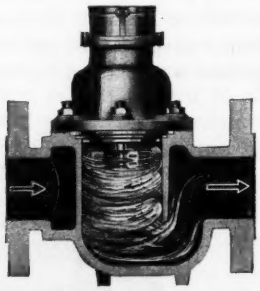


FIG. 11. ILLUSTRATING THE CONSTRUCTION AND OPERATING PRINCIPLE OF THE HENSZEY WATER METER OF THE HENSZEY DE-CONCENTRATOR CO.

STATEMENT BY METALASTIC, INC., UNION CITY, N. J.

Metalastic, Inc., is now putting an entirely new packing called Cordex on the market. Cordex is composed of metal particles, asbestos fiber, binder, and a specially prepared lubricant, neatly encased in a thin shell of viscous material. It is not manufactured in coil form but comes in straight rods, 18 in. in length. After the packing is wrapped around the rod, inserted

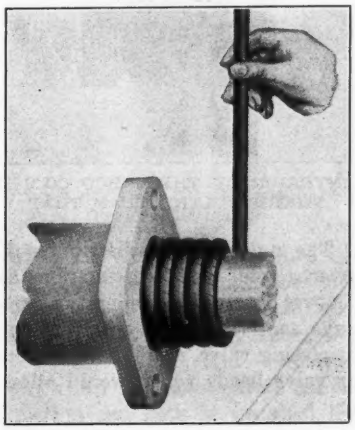


FIG. 12. INSTALLING THE NEW CORDEX PACKING OF THE METALASTIC, INC.

in the stuffing-box and the gland drawn up, the casing disrupts and a perfect seal and bearing are created. This new packing possesses all of the well known advantages of the loose form of semi-metallic packing plus the additional advantage of easy insertion into the stuffing-box.

An important advantage possessed by Cordex is that it fits any stuffing-box. It is easily cut with a knife, pair of snippers, scissors, or anything sharp that is handy. Careful measuring and fitting are unnecessary. Simply fill the stuffing-box to the desired amount and draw down the gland.

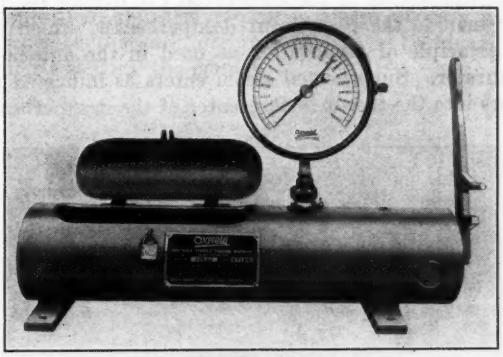


FIG. 13. PORTABLE TENSILE TESTING MACHINE OF THE OXWELD ACETYLENE CO.

Cordex has been thoroughly tested in many plants under all conditions of hard service as to temperature, pressure and steam. These tests permit the manufacturers to offer Cordex for all stuffing-box requirements. It is available in all sizes from $\frac{1}{16}$ to 1 in., packed in 18-in. lengths in cartons from 5 to 20 lb. in weight.

STATEMENT BY THE OXWELD ACETYLENE CO., NEW YORK, N. Y.

Oxweld Acetylene Co. announces the Oxweld portable tensile testing machine, designed to facilitate the testing of welds in the field or shop. This machine was developed in coöperation with Union Carbide and Carbon Research Laboratories, Inc. and, having successfully passed service tests over a period of time, is now being sold as a standard piece of Oxweld equipment.

This machine weighs 165 lb. and measures 28 in. in overall length and 6¾ in. in maximum diameter. It is a self-contained, totally enclosed unit. When closed for shipment, there are no projections and the machine presents a comparatively smooth cylindrical surface. The accompanying illustration shows how the machine appears when open and ready for making tensile tests. The machine consists of a tubular compression member with a set of grips in the heads and a hydraulic cylinder block in its base. The cylinder block contains a communicating pump and cylinder directly machined into a single block, and the cylinder pressure operates a piston carrying a second set of grips.

This machine makes it possible to secure a tensile test result immediately after welds are made. This is particularly important in connection with qualification tests for determining welders' ability. It also facilitates making periodic check tests of the operators and in many cases provides a ready means for testing sections cut at random by the inspector from completed work.

STATEMENT BY THE PALMER CO., CINCINNATI, O.

An important advance in thermometry was announced during 1930 by the Palmer Co. This is known as the Palmer red reading mercury thermometer glass, so designed as to show the mercury column as a bright

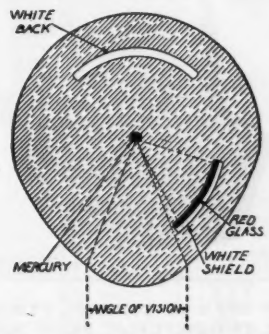


FIG. 14. DRAWING ILLUSTRATING THE PRINCIPAL OF THE PALMER CO. RED READING MERCURY THERMOMETER TUBING

red instead of the regular silver color. This is accomplished by means of reflection as shown in the sketch. Mercury is a natural mirror so that by placing a strip of red or colored glass to the side of the bore or reading column and by having this bore turned to a slant, the red is reflected on to the mercury column. From the front of the tube only the red column is seen. The mercury is not disturbed or harmed by adding chemicals and the thermometer has the effect of the red reading column without sacrificing the valuable properties of pure mercury. The glass used is manufactured by the Corning Glass Works.

STATEMENT BY THE REPUBLIC FLOW METERS CO., CHICAGO, ILL.

During 1930, the Republic Flow Meters Co. has developed flow meters for the measurement of steam, water, gas, air or oil at any pressure up to 5000 lb. These meters will give a full scale reading on a pressure differential as low as 18 in. and as high as 287 in. of water.

High pressure meter bodies are made of heavy seamless open-hearth tubing. Flanges and top caps are made from solid blocks of rolled steel. The bottom flanges, four inches thick, are screwed to the pressure chambers against a special gasket and back welded. The top flange and top caps are two inches thick and are drawn together against a special gasket by eight 7/8-in. chrome steel bolts and nuts.

Every unit of the meter body is built to withstand many times the actual pressure under which it will operate and each complete assembly is subjected to a hydrostatic test of 10,000 lb. It is adaptable to any type valve or fitting on which the particular user has standardized.

A new type of control pyrometer has also been developed by the Republic Flow Meters Co. This instrument is a combination of pyrometer, control apparatus and switching means, put together in the simplest and most compact manner. Each instrument is complete in

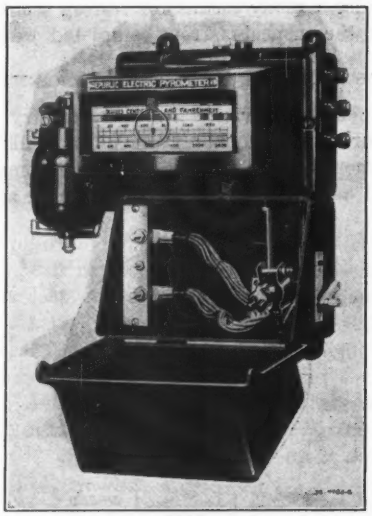


FIG. 15. A NEW TYPE OF CONTROL PYROMETER DEVELOPED BY THE REPUBLIC FLOW METERS CO.

itself and, in the majority of applications to which it may be adapted, requires no auxiliary relay apparatus of any kind. There is no work to be performed by the millivolt meter other than to indicate the temperature. There are no current carrying contact points to be opened or closed by the pointer. These have all been replaced by a simple mechanical device which operates a mercury contactor switch, designed to handle currents up to 50 amp., 220 v.

This feature has also made possible the elimination of all auxiliary relays as well as control panels for any load up to 10 kw.

STATEMENT BY THE SARCO CO., INC., NEW YORK, N. Y.

Important improvements of the design of its No. 9 thermostatic steam trap were announced during the past year by the Sarco Co. These improvements include longer bellows, protective shielding of the thermo sensitive element by a heavy brass shield and a self-centering

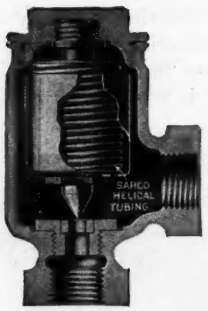


FIG. 16. INTERIOR OF THE SARCO CO.'S IMPROVED THERMOSTATIC STEAM TRAP

valve head. The longer bellows distributes the element's movement over a total of 14 corrugations and the new valve head moves freely and under the pressure of the bellows always centers perfectly in the seat. This insures a tight closing valve, and eliminates the possibility of off-center valve heads which would allow the escape of live steam.

STATEMENT OF THE STRONG, CARLISLE & HAMMOND CO., CLEVELAND, O.

Built for high pressures and temperatures, the Strong forged steel inverted bucket trap suitable for steam working pressure of 1800 lb. was placed on the market during 1930 by the Strong, Carlisle & Hammond Co. The flange and cover are of forged steel bolted together with a special alloy high temperature studs having a tensile strength of 150,000 lb. and an elongation of 18 per cent to 2 in. The trap is lined throughout with Amun-Metl. These traps are now operating in stations at pressures of 1200 lb. and temperatures up to 800 deg. F.

STATEMENT BY THE SWARTWOUT CO., CLEVELAND, O.

Developments of the Swartwout Co. during the past year include the Swartwout desuperheater, which uses the principle of atomization as used in the automobile carburetor. Superheated steam enters as indicated and passes into the throat in the center of the desuperheater.

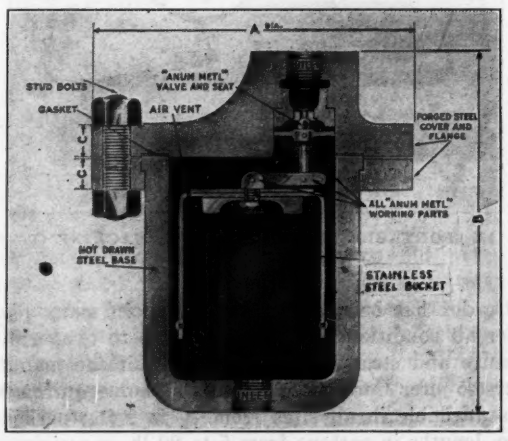


FIG. 17. THE STRONG, CARLISLE & HAMMOND CO. FORGED STEEL TRAP FOR WORKING PRESSURES OF 1800 LB.

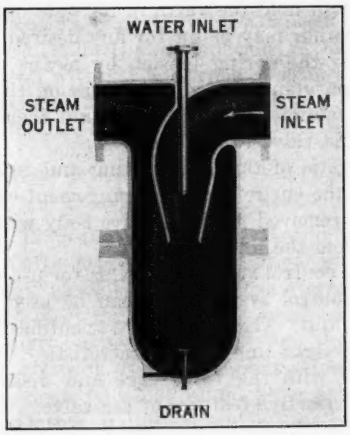


FIG. 18. CROSS SECTION OF THE SWARTWOUT CO. DESUPERHEATER

Here it is met by the cooling water which is introduced through the central pipe. Cooling water is thrown out in a conical stream. Superheated steam, sweeping past with high velocity, vaporizes and evaporates the cooling water. A complete reducing and desuperheating control station which will provide accurate temperature and pressure regulation can now be supplied by this company.

STATEMENT BY THE WATSON & McDANIEL CO., PHILADELPHIA, PA.

An intermittent or bucket type steam trap embodying new features in steam trap construction has been placed on the market during 1930 by the Watson & McDaniel Co. Some of the features of this trap are: Baffling of the outlet to prevent swirls of condensation; design of the passages to cut down the velocity of the discharge; heavy flanges to prevent gaskets from blowing; bolts set in slots so that a few turns of the nut with one wrench will displace them. The seat and stem and adjustable trunnions, on which the bucket oscillates, are made of different metals in order to reduce the wear and friction. The discharge cap can be made either right or left hand discharge or from the top in a vertical position, and a mud-blow is placed directly under the inlet so that all foreign matter can be blown out without removing the bonnet.

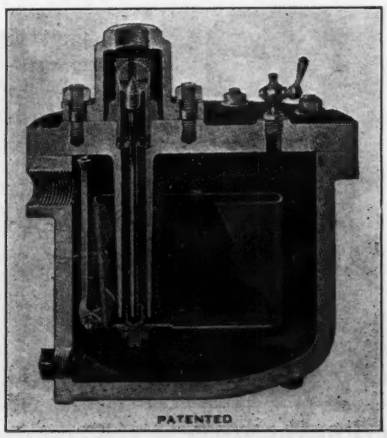


FIG. 19. CROSS SECTION OF THE NEW WATSON & McDANIEL CO. STEAM TRAP

Valves

STATEMENT BY THE ATLAS VALVE CO., NEWARK, N. J.

IMPORTANT DEVELOPMENTS of the Atlas Valve Co. for 1930 include the perfection of the Victor super-sensitive pressure regulator suitable for the regulation of steam, water, air, oil or gas where it is desired to maintain a constant reduced pressure such as heating mains, service mains, vats, cookers and retorts. It can be used also as an altitude regulator where it is desired to maintain a constant level in open tanks or as a pump governor where a constant delivery pressure is required; in fact, its use in the pressure regulating field is unlimited. It will regulate at any pressure between the initial pressure and the atmosphere in one stage and will operate control valves of from 1 to 10 in. in size. When the complete installation is made by the Atlas Valve Co., diaphragm valves are usually used with the regulator. Where back pressure and relief valves of other makes are already employed, a modified design is used, the exact design depending upon the type and exact arrangements of the valves.

STATEMENT BY THE AUTOMATIC SWITCH CO., NEW YORK, N. Y.

Several new types of solenoid operating valves for both steam and water control manufactured in sizes up to 6 in. and for up to 250 lb. operating pressure have been put out during the past year by the Automatic Switch Co. They are for heavy duty service wherever a solenoid valve is suitable. These valves can be made either normally open, or normally closed. Many steam valves of the normally open type are used for operating various steam driven equipment when the electric power circuit fails. In this case the valves are connected to the power circuit and at the failure of the electric supply, the solenoid opens the steam valve attached to the prime mover.

STATEMENT BY THE BAILEY METER CO., CLEVELAND, O.

Two new valves, one a boiler feed pump governor and the other a control valve, have been announced by the Bailey Meter Co. Several distinctive features have

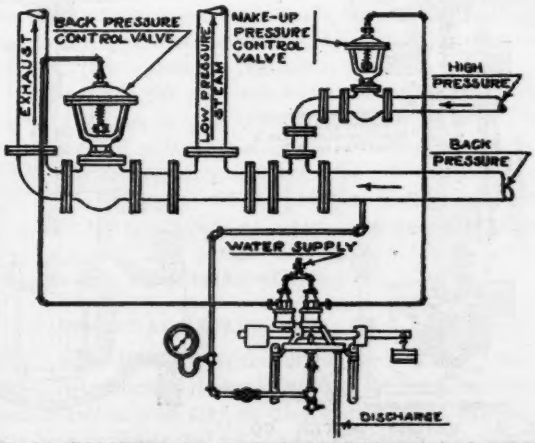


FIG. 1. DIAGRAM OF THE ATLAS VALVE CO. SUPER-SENSITIVE REGULATOR INSTALLED AT THE PLANT OF THE FERRY HAT CO., INC.

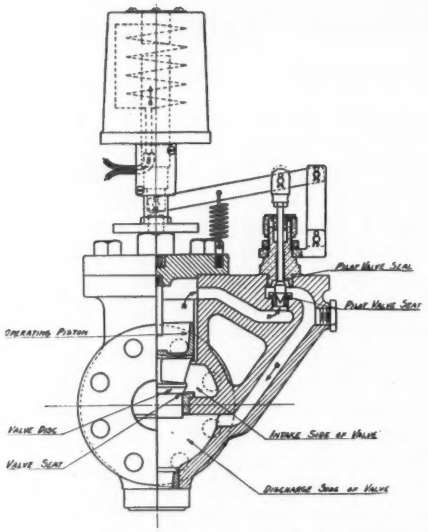


FIG. 2. TYPE S A HEAVY DUTY SOLENOID VALVE OF THE AUTOMATIC SWITCH CO.

been incorporated in the design of both valves. The new boiler feed pump governor is designed primarily for use with turbine driven pumps. Its purpose is to maintain a constant differential between the pressure of steam leaving the boiler and the pressure of feed water in the feedwater lines. The governor is installed in the steam line to the turbine and controls the differential pressure by throttling the steam supply.

Feedwater pressure is transmitted to the inside of the sylphon G, this force being balanced by the steam pressure and the spring K on the outside of the sylphon. When the steam pressure decreases, the sylphon expands moving the valve mechanism upward, thus throttling the supply of steam to the turbine. In a similar manner, more steam is admitted to the turbine when the steam pressure rises. To bypass the governor, valve A is closed and valve B is opened, thus equalizing the pressure on the inside and outside of the sylphon so that the spring will hold the valve in its wide open position.

The governor may be set for any desired differential by adjusting the spring tension by means of screw N. There are no glands or stuffing-boxes on the valve rod so that its motion is not retarded and there is no tendency for the valve to leak.

The valve is of the tight seating and fully balanced design and the entire seating arrangement can be easily installed or removed from the valve body without taking the body from the line.

The new control valve, style K, is for use with Bailey automatic control systems and can be used with practically any fluid. The V-ports are scientifically designed to give a straight line flow characteristic. A fully balanced valve with the valve cage and disks removable are other distinctive features of the valve.

STATEMENT OF THE BARCO MFG. CO., CHICAGO, ILL.

The Barco lubricated service and curb cock has been brought out during the past year by the Barco Mfg. Co. This curb cock differs from others in that it is provided with a threaded well at the top into which a pipe may be screwed, the pipe extending to the ground level after which the pipe is capped. This prevents any leakage to the atmosphere even though the valve itself should leak. This pipe may be partly filled with oil which keeps the valve in first class condition indefinitely and insures ease of operation when operation is necessary. An operating extension is also furnished to go inside of this pipe so that an extension key or wrench is not necessary to operate the valve from above ground.

STATEMENT OF H. BELFIELD CO., PHILADELPHIA, PA.

Particularly adapted to high velocities and high pressures, the new equipoise type valve is one of the latest developments of the H. Belfield Co. This valve is of compact design and is distinguished by the absence of projecting guides, nuts and dangerous exposure of corrosive surfaces. This valve can be furnished with bevel seated, semi-balanced disk; piston seated, fully balanced disk; bevel seated, V port, semi-balanced disk;

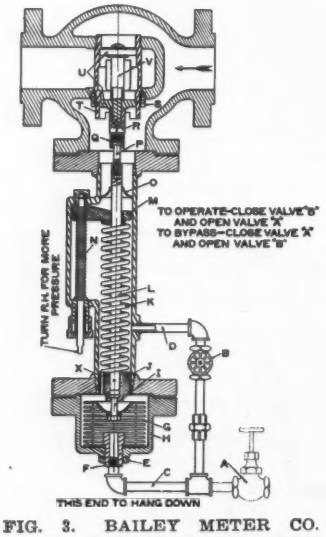

TO OPERATE-CLOSE VALVE "B" AND OPEN VALVE "A"
TO BYPASS-CLOSE VALVE "A" AND OPEN VALVE "B"
TURN R.H. FOR MORE PRESSURE
THIS END TO HANG DOWN

FIG. 3. BAILEY METER CO. BOILER FEED PUMP GOVERNOR STYLE R

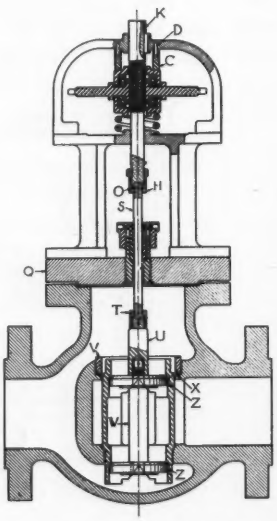
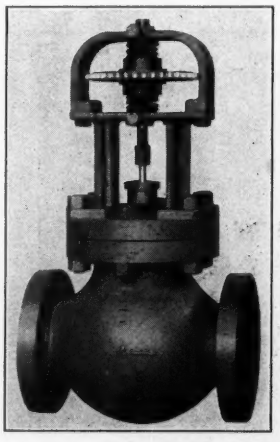


FIG. 4. STYLE K CONTROL VALVE OF THE BAILEY METER CO.



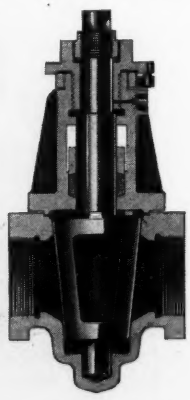


FIG. 5. BARCO MFG. CO. LUBRICATED CURB COCK

or piston seated, V port, fully balanced disk. These valves come in different combinations of metals, bronze, cast iron, steel with various trims of bronze, monel, cast iron or stainless steel. It is recommended for pressure up to 750 lb. and temperatures of 1000 deg.

STATEMENT OF THE CHAPMAN VALVE MFG. CO., INDIAN ORCHARD, MASS.

During 1930 the outstanding development at the Chapman Valve Mfg. Co. organization is a new alloy which we call electric-chrome-tungsten steel. This was developed to meet the present-day need for a metal resistant to high temperature gases, one that would not suffer from abrasion due to the great velocity and pressure of the gases, one that would be resistant to corrosion and one that would be stable and be capable of resisting, for the economic life of the equipment of which

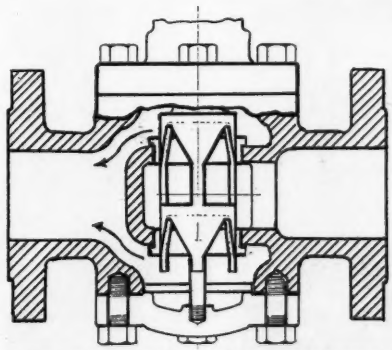


FIG. 6. CROSS SECTION OF THE H. BELFIELD CO. EQUIPOISE ROTARY SHAFT VALVE

it is a part, stresses to which it will be subjected at the temperatures employed.

Working with a definite object in mind and with the knowledge of the properties of the various component metals, the laboratory of this company developed this Chapman electric-chrome-tungsten steel which shows the following physical properties:

Tensile strength	125,000 lb. per sq. in.
Yield point	100,000 lb. per sq. in.
Elongation in 2 in.	18 per cent
Reduction of area	45 per cent
Brinnel hardness	225-250

We have put on the market within the past four months a complete line of high pressure gate and check valves, as well as a complete line of standard fittings for pressures from 150 to 1500 lbs. in strict accordance with American Standards Association code.

STATEMENT BY THE DEFENDER AUTOMATIC REGULATOR CO., ST. LOUIS, MO.

Among other developments of the Defender Automatic Regulator Co. are two pressure regulators which can be used with any type of lever or diaphragm operated regulator valve on steam, air, gas or oil lines. The regulator shown at the left is a single lever unit equipped with an operating cylinder. Several valves may be controlled by one operating cylinder or a number of cylinders may be used in a single control. A double lever unit for use on pressures from 40 to 250 lb. is shown on the right hand side, fitted with a small pilot valve for controlling the pressure to the diaphragm chamber of the regulating valve. The complete unit shown can be used as a reducing valve, pump or air compressor governor, or to control the flow of steam or liquid for practically any purpose.

STATEMENT BY THE ELECTRIC VALVE MFG. CO., NEW YORK, N. Y.

An improved packless-type solenoid valve for various service is offered by The Electric Valve Mfg. Co. The absence of a stuffing-box on the valve spindle and the use of a sealed sleeve to protect the magnet coil are important features of the packless solenoid-operated valve illustrated below. This compact, leakproof unit requires no maintenance and, being devoid of packing, is smooth and reliable in its operation.

Referring to the illustration, the movement is so constructed that the rust-proof steel plunger, which is directly connected to the stem of the valve, is free to slide in the airtight plunger housing. This plunger housing is sealed at the bottom by a gasket and at the top by a gasket and steel cap which is pressed down by a compression spring. The fluid to be controlled is allowed to flow into the plunger chamber without possibility of escaping due to the fact that the compression spring exerts a sufficient pressure to keep the plunger housing tightly sealed under all conditions.

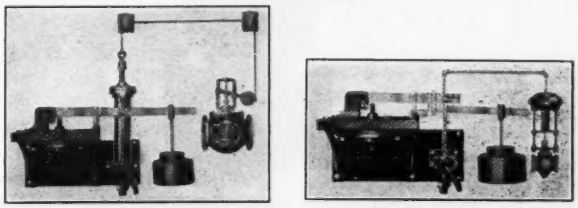


FIG. 7. COMBINATION SPECIAL CONTROL OF THE DEFENDER AUTOMATIC REGULATOR CO.

In operation, when the circuit is closed the magnet is energized, lifting the plunger to open the valve, in which position it is retained as long as coil is energized. Opening of the circuit or failure of current causes valve to close. Solenoid will not overheat when it has been energized for the maximum period for which it is rated. It can be operated direct from the lighting circuit; for remote control by means of push button; for automatic control by means of thermostat, time switch, pyrometer, float switch or pressure regulator.

To provide for any industrial requirements, various types of valves in pipe sizes from ¼ to 3 in. are used in connection with this solenoid. A few of the types which are most in demand are type "N" (single bevel disc type); type "SB" (double bevel disc, semi-balanced type); type "A" (auxiliary or pilot-operated type); type "D" (single disc type); and type "P" (double disc, fully balanced type).

STATEMENT BY JENKINS BROS., NEW YORK, N. Y.

Jenkins Bros. recently announced a new line of standard bronze valves with the one-piece screw-over bonnet and slip-on stay-on disc holder. The valves, one of which is illustrated by the accompanying photograph, are made in globe, angle cross and check types for all standard services. The one piece screw over bonnet in

combination with the slip-on stay-on disc holder is an entirely new departure in bronze valve design. The one-piece bonnet construction provides ease in removal and contributes unusual strength, prevents slipping or distortion even though the bonnet is removed and replaced repeatedly. The valve is heavily proportioned throughout.

STATEMENT OF THE MICHIGAN VALVE & FOUNDRY CO., LANSING, MICH.

The new screw lift valve of the Michigan Valve and Foundry Co. was designed to give engineers a plug type

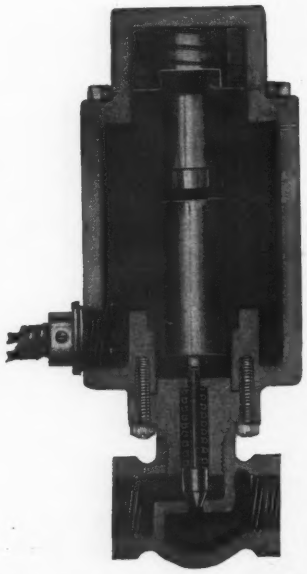


FIG. 8. CROSS SECTION OF THE ELECTRIC VALVE MFG. CO. IMPROVED PACKLESS TYPE SOLENOID VALVE

valve to meet the increasing severity of operating conditions in the field of power generation and in the process industries. Greater simplicity and dependability in the mechanism for seating and unseating the plug; greater strength, toughness and wearing qualities of valve body and plug both at atmospheric and elevated temperatures; less creep and grain growth of body and plug metal from operation in the upper temperature range; positive and consistent accuracy in plug alinement; greater resistance of wetted surfaces to corrosive action of oxidizing fluids; greater accessibility of packing gland and extra stuffing-box depth; removal of valve operating mechanism as far as practicable from wetted surfaces in service where temperatures are high; provision for more rapid radiation of heat between wetted surfaces and operating mechanism; better protection of elements of operating mechanism against contact with grit, moisture and oxidizing agents are some of the unusual features of design.

The materials used consist of iron made under the Meehanite process, alloy steels and chromium coated parts, which give the valve a large margin of excess strength, toughness and wearability. It is not necessary to dismantle even part of the screw lift valve in order to get at the packing gland. The moving parts of this assembly are given effective protection against the ingress of foreign matter and moisture by means of a grease film terminating in a grease seal just under the lower lip of the plug elevating nut and at the upper stem bearing.

STATEMENT OF THE NORTHERN EQUIPMENT CO., ERIE, PA.

During 1930 the Northern Equipment Co. developed the Copes type SLH valve, which is essentially a Copes Type BI valve operated by a hydraulic relay. It is intended for high pressure installations or where an exceptionally large quantity of water must be handled and was developed primarily for feedwater service. The first two valve of this type were furnished to the New York Steam Corp. for boiler No. 5 at Kips Bay Station. They are 8 in., 400 lb. pressure valves capable of handling 500,000 lb. per hr. of water each. This relay was

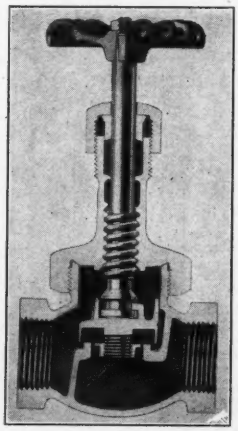


FIG. 9. ONE OF JENKINS BROS. NEW BRONZE VALVES

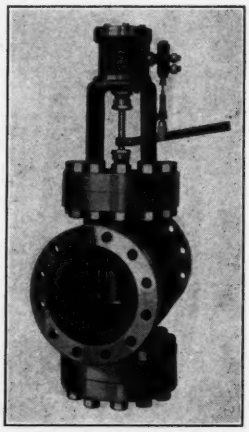


FIG. 10. NORTHERN EQUIPMENT CO. HYDRAULICALLY OPERATED VALVE

designed so that a powerful force is given to the valve movement. The action is on the straight line principle, eliminating weights, springs, levers and linkage.

STATEMENT BY THE OHIO INJECTOR CO., WADSWORTH, O.

New O.I.C. extra heavy brass gate valves with nonrising stems and solid wedges for 300 lb. working pressure have been developed by the Ohio Injector Co. These valves are designed particularly for strength and ability to stand up under severe service and high pressure. The body is of the globe type which gives maximum strength and additional strength is given to the body by ribs which extend from the body to the very heavy pipe and hexagons. The bonnet opening into the body is also heavily reënforced to prevent distortion at this point. Bonnet, stuffing-box and other parts of the valves are designed to be of equal strength with the body and all thread contacts are exceptionally liberal. The stem is of heavy design with milled threads and is made of manganese bronze. All other parts are made of a special alloy bronze of a high tensile strength which is retained to an exceptional degree under high temperatures. This valve is equipped with gland, can be packed under pressure and guides for the wedge are so arranged that the wedge cannot be reversed. These valves are made in sizes from $\frac{3}{8}$ to 3 in. in the screwed

connection type and from 1 to 3 in. in the flanged connection type.

STATEMENT BY THE RUGGLES-KLINGEMANN MFG. CO., SALEM, MASS.

One of the principal developments of the Ruggles-Klingemann Mfg. Co. for the year 1930 is a delayed action solenoid valve. The object of this development is to obtain comparatively slow opening and closing movement of the valve when operated by a rapid moving solenoid. Its further object is to permit the solenoid to complete its travel and therefore cut down the large current inrush in the shortest possible time.

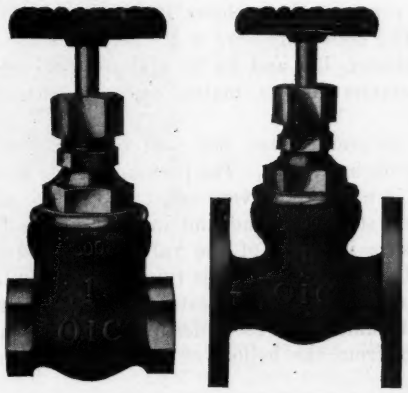


FIG. 11. NEW 300-LB. VALVES OF THE OHIO INJECTOR CO.

Solenoids must operate to close up the magnetic gap in order to cut down the inrush current for continuous rating and to hold the heat rise down to what is considered safe for the coil. No damping or retarding action can be applied directly to the solenoid plunger without danger of excessive heat rise and consequent danger of burning the solenoid coil. Often it is not desirable to operate valves with such rapid action, especially with fluid where water hammer might result. The problem of operating the solenoid rapidly without similar rapid motion of the valve, has been solved by this new development, the delayed action valve.

In the operation of this valve, a yielding spring allows the solenoid to close up its magnetic gap without retarding action and the seating of the solenoid gathers sufficient force by the compression of the spring to operate the valve in a much slower movement through the medium of dashpot action. With this arrangement, it is impossible to burn out a solenoid coil as the solenoid will seat and cut down the high inrush current regardless of whether the valve is moved or not.

STATEMENT BY RUTHS STEAM STORAGE, INC., NEW YORK, N. Y.

The AVA valves used in connection with Ruths steam storage systems have been considerably improved upon and simplified by Ruths Steam Storage, Inc. The mechanical return motion has been replaced by hydraulic return motion which has improved the stability of regulation. Photograph shows the old type valve, to the right with hand-wheel on top, and the new type valve, to the left, with hand-wheel on the side. The valve is oil operated but in case of failure of oil pressure because of disturbances in motor or oil pump, the valve closes and can then be operated by hand by means of the emergency hand-wheel mounted on ball bearings. The valve is very sensitive and keeps a perfectly constant pressure under the most trying conditions. The relay has been developed to receive pressure impulses of up to 650 lb. pressure.

One single valve can receive pressure impulses from three different sources and can do the work of three

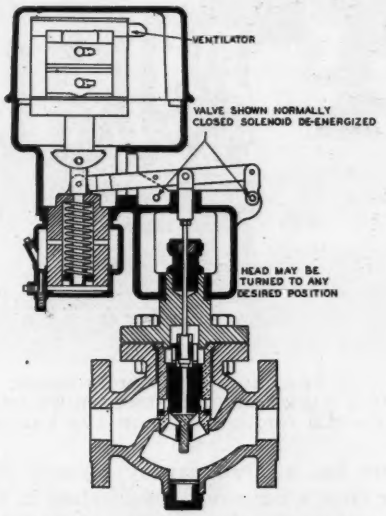


FIG. 12. DELAYED ACTION SOLENOID VALVE OF THE RUGGLES-KLINGEMANN MFG. CO.

single impulse valves combined, which makes it possible to use the valve in very interesting regulating problems. Several regulating valves are usually installed close together, forming a centralized steam switchboard, as illustrated below. The two valves in the center are overflow valves, maintaining a constant boiler pressure of 650 lb. The valve to the left is a two-impulse overflow reducing valve and the valve to the right a reducing valve. The accumulator in this picture is also used as a desuperheater. (The combination photograph and diagram is from Waldorf Paper Products Co., St. Paul, Minn., described in Power Plant Engineering, July 1, 1930.)

In most steam accumulator plants, steam is passed from or to the accumulator only at times of peaks or off-peaks in the steam demand. Most of the steam is being bypassed through the regulating valves, as shown left of accompanying diagrams. Steam coming from the accumulator is always dry saturated. Two interesting arrangements have been made that differ from the usual type of steam accumulator installations. In one, the Ruths accumulator is used only as a desuperheater for superheated steam; in the other, Ruths steam accumulator is used also as steam separator for very wet steam. The arrangement in both cases is the same, all the steam being passed through the water in the accumulator before being delivered to the steam consumer, as shown on the right-hand diagram. In both cases, the steam leaving the accumulator is dry saturated steam.

In the first case, makeup water must be supplied to the accumulator to balance the desuperheating effect. Raw water can be used as the makeup water is evaporated in the accumulator. The accumulator as a de-

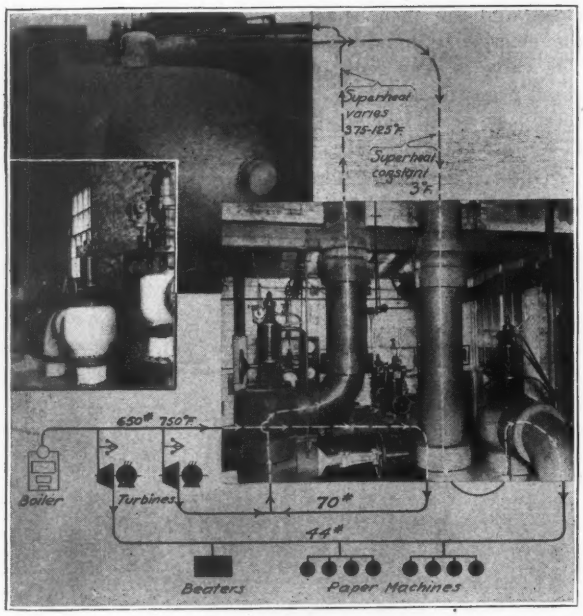


FIG. 13. THE NEW RUTHS STEAM STORAGE, INC., AVA VALVES IN A PAPER MILL. INSERT SHOWS NEW (LEFT) AND OLD (RIGHT) TYPE OF AVA VALVES

superheater has a large standby capacity and would not suffer from a temporary interruption in the supply of makeup water as the accumulator contains a large volume of water which it would take many hours to evaporate. In the second case, when using the accumulator as steam separator, water must be drawn from the accumulator so as to maintain the water level constant.

An interesting accumulator installation has been started up in an oil refinery. The pumps supplying oil to the stills are electrically driven. There is, however, also a steam driven emergency pump to supply oil to the stills in the event of electrical interruption, causing

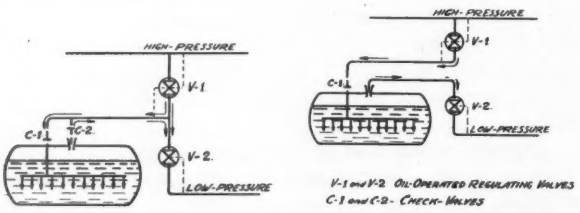


FIG. 14. DIAGRAMS ILLUSTRATING THE ACTION OF THE RUTHS STEAM STORAGE, INC., AVA VALVES

shutdown of the electrically driven pumps normally doing the work. Before the installation of the steam accumulator, it was necessary to keep sufficient boiler capacity in banked condition so as to be able to take care of emergency operation of the steam-driven pump. Starting up of this pump, however, resulted in boiler pressure being pulled down, which had a bad effect on operation throughout the mill. The steam accumulator is large enough to supply steam for half an hour's operation of the emergency pump, therefore it is not necessary any more to keep any banked boilers, nor will the starting up of the pump cause any drop in boiler pressure.

They do not require the operation of this pump for more than 20 min. as this would be sufficient time to permit them to pull the fires from under the stills. The distance from the boiler house to the pump house is very great and the steam at the end of the long pipe line is very wet. It was difficult to start up the pump with wet steam, but all the steam now is passed through the accumulator, the accumulator acting as a steam separator, supplying dry saturated steam to the pump. This has proven to be of great benefit to the pump.

In steel works, steam hammers cause a fluctuating steam demand resulting in a fluctuating boiler pressure. It is important for perfect operation of the steam hammers to have a constant pressure. By inserting a steam accumulator between the boiler main and the steam hammer main, great benefits are obtained. The attached two-pen pressure chart shows the operation in such a plant. The boiler pressure is 125 lb. The accumulator varies between 125 and 85 lb. and the pressure in the steam hammer line is maintained constant at about 85 lb.

This diagram shows the perfect operation of the AVA regulating valves. The pressure in the steam hammer line is maintained very constant in spite of a very fluctuating steam demand and in spite of the fact that the pressure in front of the valve varies between 125 and 85 lb. In a plant of this type, the accumulator can also be used as a steam separator resulting in dry steam for the hammers, or as a desuperheater if the steam furnished from the boilers or from turbines is superheated.

Statement by The Schutte & Koerting Co., Philadelphia, Pa.

Hydraulically operated venturi reducing valves designed for maximum working pressures of from 250 to 450 lb. have been put on the market by The Schutte & Koerting Co. They are recommended for installation where a tight seating valve is required. The valve body is carefully proportioned to produce smooth flow with the outlet side venturi shaped to allow correct expansion of steam. Outlet regulation of reduced pressure is obtained with an especially designed tapered disc having long travel. A pilot valve is used to obtain balanced

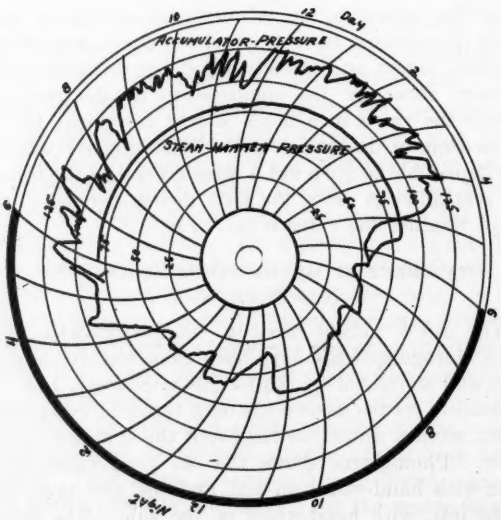


FIG. 15. STEAM CHART SHOWING HOW EFFECTIVELY THE RUTHS STEAM STORAGE, INC., AVA VALVE REGULATES PRESSURES

action and little power is required for operating the valve. The hydraulic regulator connected to the low pressure header operates a small hydraulic pilot valve which controls the flow of the pressure water to the hydraulic cylinder mounted on the valve yoke. Changes in pressure are immediately corrected and this valve maintains constant pressure within narrow limits.

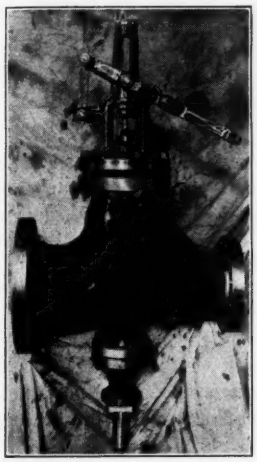


FIG. 16. THE NEW SCHUTTE & KOERTING CO. BALANCED VENTURI REDUCING VALVE

For motor-operated pressure reducing valve and desuperheater control, this company has also developed the Type F electric control. This control is connected by a pressure pipe to a header at the point where the steam pressure is to be regulated. Changes in pressure operate a Bourdon tube arrangement to which is attached a pointer which carries a mercury switch. Make and break contacts are made by telechron motor operating mercury switches. Slight changes in pressure close the electric circuit momentarily and slight surges of current are sent to the operating motor or reducing valve to open or close the valve a slight amount. Larger changes cause steady application of current to fully open or close the valve to increase the flow or shut it off entirely depending upon conditions. The control is quite sensitive and may be installed at a considerable distance from the motor operated valve. It may also be utilized to regulate header pressure by controlling the action of motor operated fly wheel governors on engines or motor operated rheostats on turbines.

The new Type F control may also be used to regulate the temperature in the steam header by regulating the flow of steam through a motor operated reducing valve which discharges into a desuperheater having a constant water flow. The temperature may also be governed by controlling a motor operated water valve which regulates the flow of water to the desuperheater, the steam flow remaining constant.

FIG. 17. THE SCHUTTE & KOERTING CO. TYPE F ELECTRIC CONTROL

STATEMENT BY THE STRONG, CARLISLE & HAMMOND CO., CLEVELAND, O.

Among the developments of the Strong, Carlisle & Hammond Co. is the Strong Type P packless super-sensitive regulating valve. This valve is particularly adaptable for installations requiring very accurate regulation at low pressure. It is suitable for steam or gas

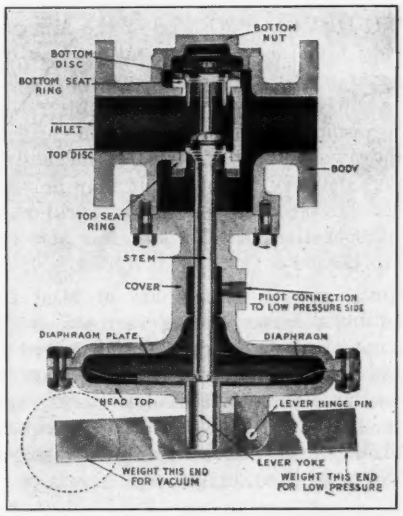


FIG. 18. PACKLESS TYPE P SUPER-SENSITIVE REGULATING VALVE OF THE STRONG, CARLISLE & HAMMOND CO.

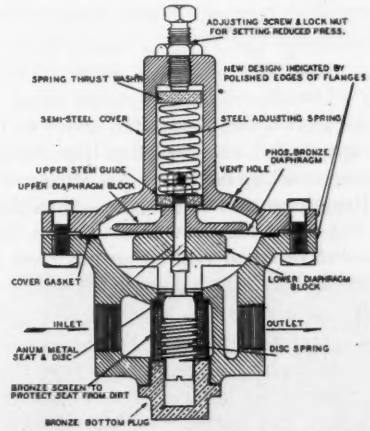


FIG. 19. NEW DESIGN OF THE STRONG, CARLISLE & HAMMOND CO. TYPE K REDUCING VALVE

and may be used either with or without pilot connection as installation conditions warrant.

Another development is the improved design of the Strong Type K reducing or regulating valve shown in section. A number of improvements have been made and the self-contained strainer removes one of the principal and most common causes of reducing valve failures, namely dirt and scale.

Compressed Air Equipment

Compressors, Blowers, Air Motors, Tools and Filters

STATEMENT BY THE AMERICAN BROWN BOVERI CO., INC., CAMDEN, N. J.

AMONG DEVELOPMENTS of the American Brown Boveri Co., Inc. may be mentioned an order for a turbo-compressor for the Randfontein Mines (S. Africa) recently secured and which is very interesting in that this compressor is the second largest in the world, being for an indrawn volume of 45,000 c.f.m. and 95 lb. per sq. in. gage delivery pressure. It may be recalled that the largest turbo-compressor in the world was put into successful operation in 1929 and was also constructed by Brown, Boveri & Co., for S. Africa.

Continual growth in the size of blast furnaces is paralleled by a corresponding increase in the size of blast furnace turbo-blowers. As far as we are aware, the largest turbo blowers in the world are at present under construction at the Baden works, and are intended for the U.S.S.R. Each blower is capable of handling 116,500 c.f.m. of free air and delivering it at pressures of 23 to 26 lb-sq. in. ga.

At the Camden plant, five large blast furnace turbo-blowers have been manufactured this year. Each is capable of handling 60,000 to 80,000 c.f.m. of free air under 18 to 30 lb. per sq. in. ga. delivery pressure.

A noteworthy order for a motor-driven converter blower has been obtained this year. This blower is driven by a 5000-hp. induction motor which is provided with regenerative speed regulation above and below synchronous speed and compensation for obtaining unity power factor at all loads on the Brown Boveri-Scherbius system. Remote control of the speed from the operator's platform has also been provided. This is the first time that regenerative speed regulation has been adopted for such a large output with a blower drive.

The past year has also been interesting on account of the considerable number of plants which were put into successful operation, where 4-cycle Diesel engines pressure charged by means of a turbo-blower driven by an exhaust gas turbine on the Buchi system are used. According to latest reports, the number of blower sets supplied or on order on the Buchi system amounts to 106, and the corresponding total output of Diesel engines to no less than about a quarter of a million indicated horsepower. In view of the uncontested success obtained with Diesel engines with this form of pressure charging, it must be deplored that American Diesel engine builders have shown themselves so laggard and have not yet ventured to give this system a trial.

Work has been actively pursued in connection with special designs of turbo-blowers for refrigerating plants. We are not, however, in a position to disclose any details. Improvements have also been made to the designs of special blowers for use on board submarines, which have resulted in a still further reduction in weight.

STATEMENT BY THE BURT AIR FILTER CORP., AKRON, O.

Employing for a filter media a pad which is made up of layers of cloth fiber of various densities, the new

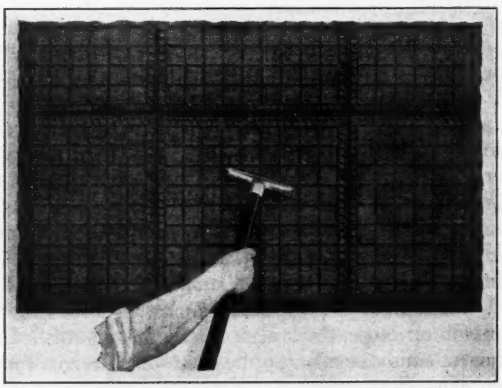


FIG. 1. CLEANING THE NEW BURT AIR FILTER CORP. AIR FILTER WITH A VACUUM CLEANER

Burt Fiber Air Filter has been developed and put on the market by the Burt Air Filter Corp. It is made in several variations as to size of cell and resistance of filter media. The standard cell is 20 in. square and built for unit installation. No frames are required because the cell is rigidly constructed from steel and is designed so the individual units can be bolted together into an air-tight installation.

The filter media is made from a combination of jute and cloth fibers clamped together into a pad and supported by a metal frame as shown by the accompanying illustration. The jute and cloth are arranged in layers of varying density with the coarser woven material on the air intake side of the filter. The illustration shows the method employed in cleaning the cells. An ordinary industrial type vacuum cleaner is used and the nozzle is applied over the surface of the cell until the accumulated dirt has been removed and the resistance returned to normal. The filter cell can be cleaned in this manner over a long period of service and the resistance will always return close to the normal figure.

FIG. 2. ONE OF THE CHICAGO PNEUMATIC TOOL CO.'S NEW TYPE V-CO ENGINE DRIVEN AIR COMPRESSOR

STATEMENT BY THE CHICAGO PNEUMATIC TOOL CO., NEW YORK, N. Y.

Diesel driven compressors, Type V-CO have been developed and installed by the Chicago Pneumatic Tool Co. to an extent that has proved their value as an economical self-contained power plant. This has been particularly true on large engineering projects where the need for power over a long period is essential. A typical installation as shown by the photograph is one of two 120-hp. CP Diesel driven compressors installed by one of the contractors engaged in building an extension of the Philadelphia subway.

In the pneumatic tool field, the rotary principle has been developed and applied to various pneumatic tools such as grinders, concrete surfacers and drills. One of these rotary motors has also been adapted for use with a Quimby sump pump weighing but 44 lb. with a capacity of 100 gal. per minute at a 28-ft. head. As this type pump is not of the suction type, it requires no priming. All that is necessary for this fast pumping unit is to start the motor running before submersion and lower the complete unit into the manhole or pit to be drained and the water is immediately and steadily pumped out without priming. The exhaust air from the motor serves to rid the manhole or pit from dangerous gases or fumes while pumping.

STATEMENT OF THE DE LAVAL STEAM TURBINE CO., TRENTON, N. J.

During 1930, the De Laval Steam Turbine Co. has built what is believed to be the largest centrifugal blast furnace blower in the United States for one of the leading blast furnace and steel plants. This machine consisting of a 5-stage centrifugal compressor of the single suction type, directly coupled to an impulse pressure stage steam turbine, has a maximum capacity of 115,000 cu. ft. per min. against 30 lb. per sq. in. ga. pressure. The turbine was designed to operate on steam at 400 lb. per sq. in., superheated 200 deg. F., and exhaust to a vacuum of 28 in. The speed of the unit is 2600 r.p.m.

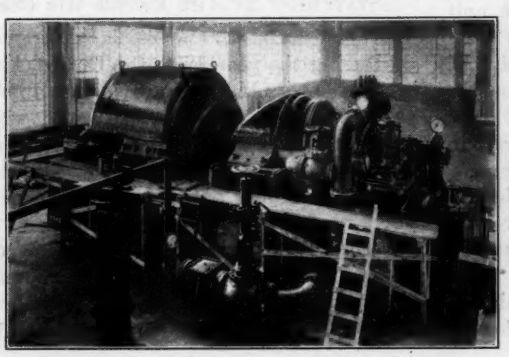
For such services, this type of compressor is highly efficient and exceptionally rugged in construction. Both turbine and compressor have large internal clearances, low rotative and peripheral speeds, and heavy, rigid shafts, which give a high factor of safety. The critical speed of both turbine and compressor is considerably above the maximum operating speed. Compressors of this general type are built for pressures up to 100 lb. per sq. in. capacities. Centrifugal compressors are also frequently driven by electric motors, in which case a speed increasing gear of the double helical type is employed in order that the compressor may operate at a suitable speed while using a standard speed motor.

STATEMENT OF THE PENNSYLVANIA PUMP & COMPRESSOR CO., EASTON, PA.

The Class 14-A power driven (Class 15-A steam driven) two-stage tandem type air compressor, suitable for pressures up to 250 lb. per sq. in., was designed by the Pennsylvania Pump & Compressor Co., for the purpose of providing a compressor which, within the range of its capacity, would meet all the requirements of two-stage tandem service and which at the same time would be more economical of floor space than the standard two-stage tandem type. The feature of this compressor is that the high-pressure cylinder is single-acting instead of double-acting as in standard construction and is attached directly to the low-pressure cylinder without any distance piece between the two cylinders. A plunger at the end of the piston acts as the piston for the high-pressure cylinder and compresses the air in this cylinder at every stroke of the piston rod. This construction, when combined with the overhead type of motor mounting for multiple belt drive, makes a very compact unit.

FIG. 3. (LEFT) CHICAGO PNEUMATIC TOOL CO.'S ROTARY MOTOR DRIVING A QUIMBY SUMP PUMP

FIG. 4. (BELOW) A 115,000-C.F.M. BLOWER BUILT BY THE DELAVAL STEAM TURBINE CO.



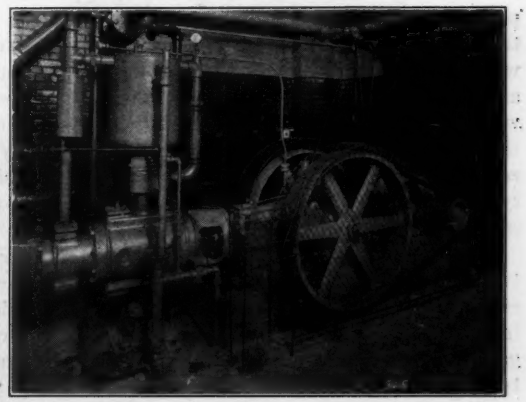


FIG. 5. ONE OF THE PENNSYLVANIA PUMP & COMPRESSOR CO.'S NEW CLASS 14-A COMPRESSOR

STATEMENT BY THE SULLIVAN MACHINERY CO., CHICAGO, ILL.

Many new designs and developments have been made by the Sullivan Machinery Co. during the past year. Some of these are changes in established lines of types of machine, while others are complete new designs made to meet specific industrial demands or to take advantage of current developments in other fields, as for instance the internal combustion engine and the V-belt drive.

Improvement in the angle compound compressors are really the most important made during the year and are of distinct interest to the power plant engineer. These include: improved construction and increased bearing areas, thus insuring even superior operating service to the excellent angle service previously given; forced-feed lubrication under pressure to crankpins, an exclusive Sullivan feature in large compressors; all oil piping to moving parts is enclosed within the frame, thus securing maximum cleanliness and improved tubular type intercooler with the Sullivan three-pass cooling system.

The Sullivan angle Diesel driven semi-portable compressor of the type shown by the photograph is something new for the contractor doing heavy construction work. This type combines the economy of the Sullivan angle compound compressor and the Diesel oil engine with reasonable portability. As will be noted the unit includes the Sullivan angle compressor driven by Texrope or V-belt from a Buda Diesel engine of the M.A.N. type. Fuel tank and air receivers are mounted on the same base with the power unit and radiator.

Another portable unit of importance is a 4¾ by 4 in two-cylinder vibrationless portable compressor having a capacity of 66 c.f.m. It is driven by special flexible interlocking coupling from a four-cylinder, four-cycle gasoline engine and is equipped with the most modern type of automobile engine and accessories.

For use in locations where pipes are not desirable or satisfactory water supply is not obtainable, or where a self-contained motor driven compressor unit is needed, the Sullivan WL-22 vertical compressor with radiator assembly is now available. The illustration shows the compact and convenient arrangement.

Two new units have recently been added to the Sullivan line of small stationary air compressors, namely the WL-1, belt driven, and the WL-11, direct motor driven vertical single cylinder compressors. They are built in two sizes, 5½ by 5 and 6½ by 5¼ in.

For high-pressure work, two new types of high pressure compressors were developed. These are two and four-cylinder, two-stage units built for direct connection or belt drive and suitable for a maximum pressure of 400 lb. per sq. in. Capacities range from 55 to 150 cu. ft. of free air per minute. In this class of high-pressure machines can also be included a horizontal two-stage steam driven compressor, designed primarily for oil field service and shown in the photograph.

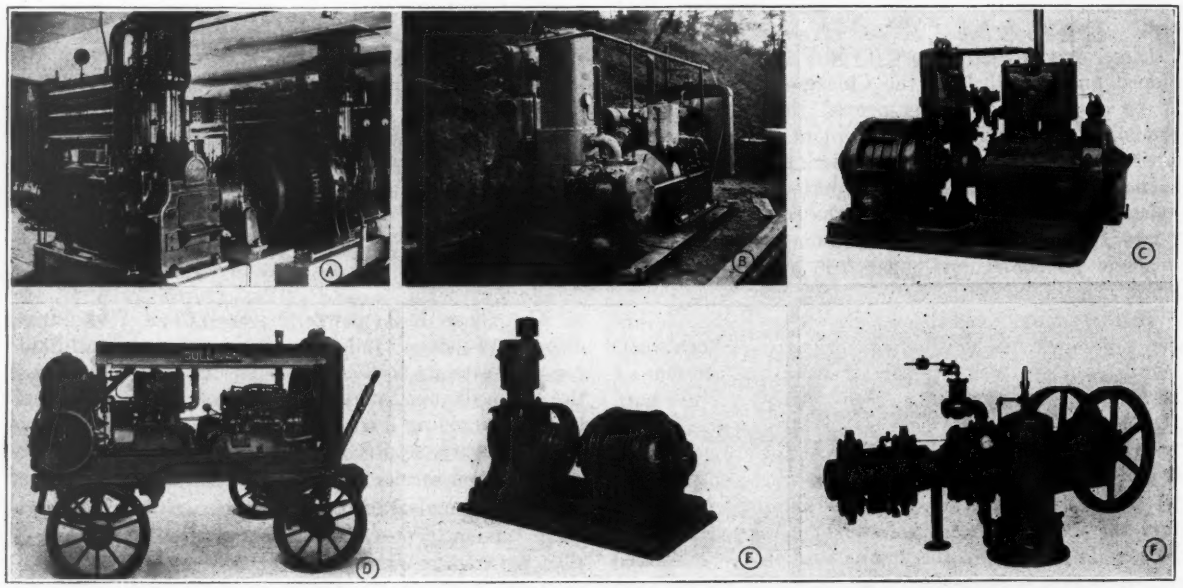


FIG. 6. SOME NEW DEVELOPMENTS OF THE SULLIVAN MACHINERY CO. A, THE IMPROVED ANGLE COMPOUND COMPRESSOR. B, DIESEL DRIVEN SEMI-PORTABLE COMPRESSOR. C, VERTICAL COMPRESSOR WITH RADIATOR ASSEMBLY. D, THE NEW SIZE VIBRATIONLESS PORTABLE. E, NEW SINGLE-CYLINDER VERTICAL COMPRESSOR, WL-11. F, A TWO-STAGE STEAM DRIVEN HIGH PRESSURE COMPRESSOR FOR OIL FIELD SERVICE

Other developments consist of units with the compressor and motor pulley arranged to take advantage of the new style V type belt for short center drive and a new line of low pressure angle compressors and angle vacuum pumps. Larger sizes of vacuum pumps are made in the angle instead of the horizontal duplex type.

STATEMENT BY THE UNITED AIR CLEANER CORP., CHICAGO, ILL.

During the year 1930, the United Air Cleaner Corp. brought out its Imperial air cleaner, an oil cleaner which uses an entirely new principle and which is designed particularly for motor application. It raises continuous screens of heated oil by means of power taken from the exhaust and does not depend on air velocities for the purpose of mixing the oil with the air. On the instant the motor starts, exhaust gas is conducted just below the oil level in the lower chamber and the curtain of oil or oil spray is raised into the air stream.

At all speeds of the motor, an outside force lifts an

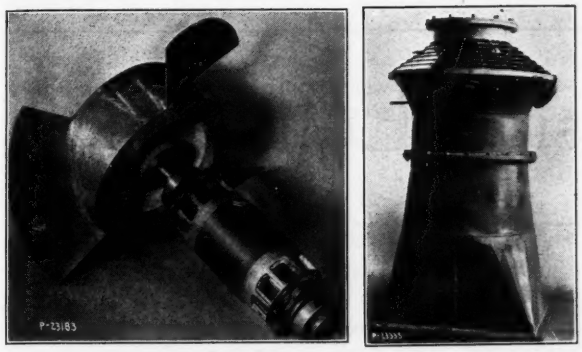


FIG. 7. THE ROTATING ELEMENTS OF A WESTINGHOUSE ELEC. & MFG. CO. PROPELLER FAN (LEFT) AND TURBINE DRIVEN PROPELLER FAN WITH AN ALL WELDED CASING (RIGHT)

oil screen into the air stream, mixes the oil and air, thoroughly cleans the air, and works with equal sureness in all extremes of outside temperature. The air inlet and passages throughout the cleaner, being large, avoid power loss due to restriction.

Dirt taken out by the primary cleansing settles at the bottom of the oil reservoir provided at the bottom of the cleaner. The upper chamber, containing the loosely packed kinked wire, is provided with drain-backs which are not in the path of lowest depression. Through these drain-backs the oil, together with the slight amount of dirt not caught in the primary cleansing, pass to the reservoir below. The chamber of kinked wire also serves to separate the oil from the air particles before they pass to the carburetor. The constant circulation of hot oil through the wire filter makes the filter self-cleansing, which makes it capable of continuous operation without servicing. There are no moving parts in the cleaner and the cleaner should last throughout the life of the equipment on which it is used.

Statement by The Westinghouse Elec. & Mfg. Co., Philadelphia, Pa.

In the field of power plant auxiliary equipment, the outstanding developments of the year by the Westinghouse Elec. & Mfg. Co. have been the propeller blower and propeller pump. Motor and turbine driven blowers of the type illustrated have been built for a variety of services from ship ventilation to power plant forced-draft fans and commend themselves to owners and operators because of their high efficiency, extreme simplicity and light weight.

Statement by The Worthington Pump & Machine Corp., Harrison, N. J.

One of the important contributions in the field of compressed air machinery during 1930 was the introduction by the Worthington Pump & Machinery Corp. of an automatic governor for volume control on its five-step variable capacity compressors. This governor, of a single automatic diaphragm type, absolutely controls the entire unloading cycle. It is positive in its operation and is sufficiently sensitive to control the discharge pressure was within very close limits. As an integral part of the governor there is included a low voltage unloader which protects the compressor against interruptions due to low voltage.

Statement by Yeomans Bros. Co., Chicago, Ill.

Yeomans Air Compressors built by Yeoman Brothers Co. are in operation in numerous industrial plants and sewage ejector stations throughout the country. This rotary compressor, as illustrated, is constructed in such a way that there is no actual contact between the vanes and the interior surfaces of the casing. At all times there is a clearance of 0.002 in between the blades in the rotor and the casing. Improved new type Yeomans automatic oil economizers insure adequate lubrication.

These compressors can be used for all pressures up to 50 lb. ga. and can be operated at high speed. The maximum of the two smaller sizes being 1750 r.p.m. and 1150 r.p.m. for the three larger sizes. Being of multivane type, the flow of air from the discharge is practically free from pulsation and ordinary swing check valves can be used without any tendency to flutter. The multivane design produces a satisfactory volumetric efficiency and as the rotor is supported on roller bearing and friction losses in the casing are exceedingly low, the mechanical efficiency is likewise high. These machines are admirably adapted to dry vacuum duty up to 90 to 95 per cent of the barometer. They are not suitable for wet vacuum service.

Air cooled compressors as shown in the accompanying illustration can be furnished in sizes No. 25 and 60 for maximum pressure of 7 lb. continuous and 12 lb. intermittent duty. Standard water-cooled compressors are built in all sizes with openings in the casings for circulating water from the city supply. Where the latter is not available, compressors can be fitted with a centrifugal cooling water circulating pumps. As the compressor is of the positive displacement type, no water seal is required. For portable use, compressors can be mounted on a wheeled truck and cooled by the use of the circulating water pump referred to.

Casings of these machines are of close grained cast iron as is the rotor, which is cast on the shaft to insure against slipping. Vanes are of spring steel carefully ground to exact dimensions and are kept from actual contact with bore of the casing by rotating rings. The compressor can be directly connected to motor or other form of driving unit by pin and buffer type flexible coupling and both compressor and motor are mounted on a substantial cast-iron base plate.

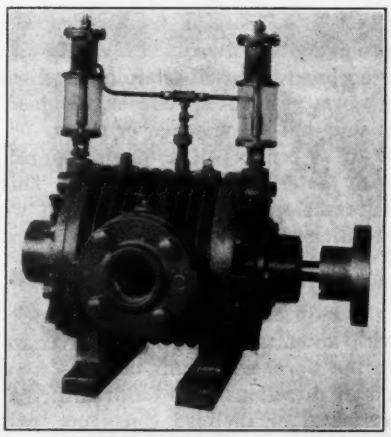


FIG. 8. NO. 25 AIR COOLED ROTARY AIR COMPRESSOR OF YEOMANS BROTHERS CO.

Power Transmission Equipment

Speed Changers

STATEMENT BY THE H. W. CALDWELL & SON CO., CHICAGO, ILL.

PURSUANT with its plan to standardize various driving mediums, H. W. Caldwell & Son Co. has announced Caldwell Standardized Drives for screw conveyors. This is a new drive for 9, 10 and 12-in. screw conveyors, compact, clean-cut and trim in appearance, highly efficient, positive and quiet in operation and made in two types, Model C and Model D.

Type C drive consists of two speed reductions from motor to screw conveyor, each through a high grade

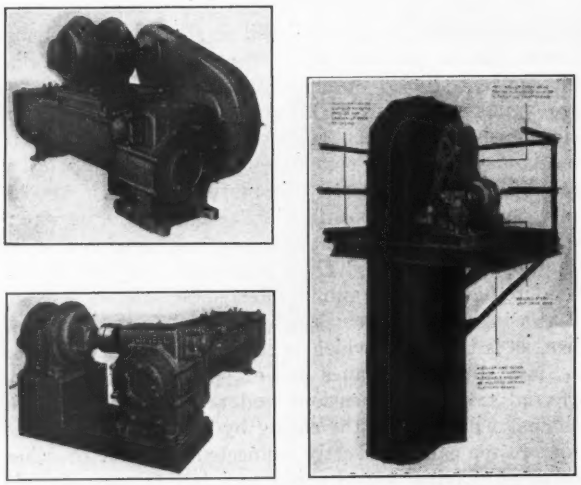


FIG. 1. H. W. CALDWELL & SON CO TYPE C (TOP, LEFT) AND TYPE D (BOTTOM, LEFT) STANDARDIZED DRIVE FOR BUCKET ELEVATOR AND (RIGHT) STANDARDIZED ELEVATOR DRIVE

power transmission medium, a Link-Belt silent chain drive fully enclosed in an oil-retaining steel casing, and an efficient worm gear speed reducer, designed to serve as a thrust end, and screw conveyor drive.

Type D drive consists of a direct coupled reducer, mounted with motor on unit base plate. This type of drive permits the selection of a Caldwell worm gear reducer according to horsepower rating, without regard to the size of the conveyor trough on which the drive is to be mounted.

All of the reducer bearings on both types are anti-friction, with automatic lubrication. Oversize Timken bearings on the worm gear shaft take the conveyor end thrust in either direction. The Caldwell drive is adaptable to horizontal or inclined conveyors, with proper adjustment of the oil levels. Standard motors of 860, 1160, 710 or 1430 r.p.m., can be accommodated on these conveyor drives. Standard drives provide a range of conveyor speeds from 45 to 125 r.p.m.

A new standardized drive for elevators has also been announced. This drive is compact, efficient and positively quiet at all speeds. It is built to operate centrifugal discharge, perfect discharge or continuous bucket elevators requiring 3 to 15 hp. The entire line is standardized and carried in stock.

The first reduction of the drive is made up of a ruggedly built fully enclosed worm gear speed reducer to which a motor is coupled. The motor and the worm reducer are accurately alined on a welded steel base, making a compact assembly easily supported on the elevator casing or platform.

The second reduction in speed is made by a Link-Belt roller chain drive, which was selected because it furnishes a maximum of strength, durability, efficiency and quietness of operation, combined with a minimum of weight and of space required. It also acts as a flexible connection between the reducer shaft and head shaft.

STATEMENT BY FOOTE BROS. GEAR & MACHINE CO., CHICAGO, ILL.

After a great deal of study, investigation and research work, the engineering department of Foote Bros. Gear & Machine Co. developed a new IXL Titan Speed

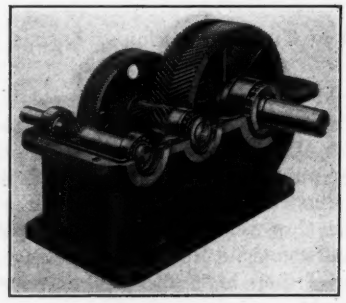


FIG. 2. ONE OF THE NEW SPEED REDUCER UNITS OF FOOTE BROS. GEAR & MACHINE CO.

Reducer line to meet the demand that has developed for the helical type of gear reduction unit. They are made in four distinct types: Type SX, single reduction unit; Type DX, double reduction unit; Type RSX, single reduction right angle bevel unit; Type ROX, double reduction right angle bevel unit. One of these units is illustrated above. Anti-friction bearings have been adopted as standard in the design of these speed reducers and the range of efficiency varies depending upon the ratio used. For the single reduction units, the efficiency for low ratios run as high as 98 to 99 per cent under full load and for double reduction units, as high as 96 to 98 per cent under full load.

STATEMENT OF THE W. A. JONES FOUNDRY & MACHINE CO., CHICAGO, ILL.

The W. A. Jones Foundry & Machine Co. is just putting on the market a Herringbone Gear cut by the Sunderland process. The tooth profile in a true involute with a helix angle of 30 deg. and a pressure angle of 20 deg.

STATEMENT BY THE LINK-BELT CO., CHICAGO, ILL.

Recently an all-metal variable-speed transmission has been announced by the Link-Belt Co. It is called the P.I.V. gear, the initials standing for Positive Infinitely Variable.

This speed change unit consists of two pairs of wheels of the opposed conical disc type, between which a chain transmits power. The effective diameters of each pair of wheels can be altered under load to change the speed

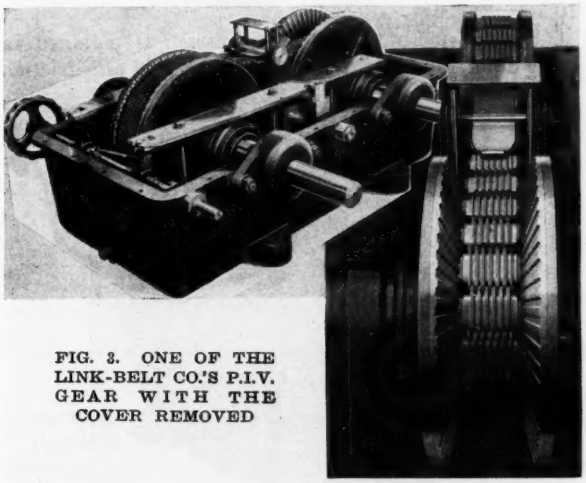


FIG. 3. ONE OF THE LINK-BELT CO.'S P.I.V. GEAR WITH THE COVER REMOVED

ratio, without steps and without dependence upon friction. On changing speed, the self-pitching chain rises in one set of wheels and descends in the other, so that, while the input shaft connected to a motor or other source of power turns at constant speed, the output shaft is brought to the desired speed.

The original feature of this gear is its use of a positive chain drive to transmit the power. Radial teeth are cut in the conical faces of the driving discs and the self-adjustable teeth projecting beyond the sides of the chain are arranged to engage the radial teeth of the discs positively. The chain is made up of a series of steel leaves or links with joints of hardened steel pins turning in segmental bushings. On the inner surface of this chain are packs of hardened steel laminations or slats which extend through slots in the links at right angles to them, and project about ⅛ in. at each side of the chain. The individual containers which hold the packs of slats are secured in the openings of the links but, within each such container, the slats are free to slide from side to side individually with relation to each other and adjust themselves to engagement with the radial teeth of the discs, over substantially the full range of diameters. The angle of the slat ends, 30 deg., is, the same as that of the conical faces of the wheels.

Teeth of the discs widen from the center outward toward the circumference but are of uniform depth. They are so staggered relatively on each pair of wheels that the slats move back and forth into the teeth to mesh correctly as the chain comes into contact with the wheels; thus self-pitching of the chain to any tooth width or wheel diameter is assured. At each engagement of the chain and wheels, the slats are regrouped within their separate containers but they do not slide nor move under working pull.

Elements of the gear include a compact oil-tight housing, splash lubrication, hardened steel wheel faces mounted on cast-iron hubs backed by ball thrust bearings, moving axially on the shafts, which in turn are mounted in radial ball bearings. Movement of the pairs of wheels together or apart to change their effective pitch diameters is controlled by a pair of pivoted levers operated through a hand-control shaft with right and left-hand screw motion. Initial chain tension is provided for by an external adjustment screw, and correct operating tension is maintained at all ratio settings, by two hardened shoes which ride lightly on both upper and lower strands of the chain, under constant spring pressure. A speed indicator permits ready check-up on operating speed settings.

The P. I. V. gear is for the present, made in five sizes, from 1 to 10 hp. capacity, providing speed change ratios up to a maximum of six to one.

STATEMENT BY THE REEVES PULLEY CO., COLUMBUS, O.

Improvements in the method of providing electric automatic control and electric remote control for the Reeves variable speed transmission have been developed by the Reeves Pulley Co.

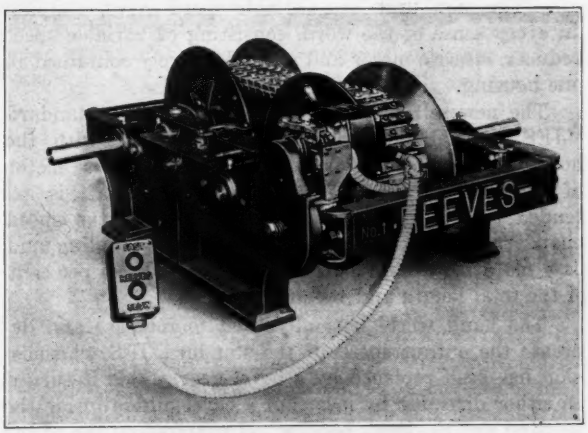


FIG. 4. APPLICATION OF REEVES PULLEY CO. ELECTRIC REMOTE CONTROL

By means of the Reeves Electric Automatic Control, the speed of the transmission and, in turn, of the machine or machines to be controlled, may be infinitely regulated over a predetermined range entirely automatically, it is stated, while the operator of a machine equipped with the remote control may, without leaving his position, accurately regulate the speed of one or more machines merely by pressing a button.

On rotary veneer lathes, stoker drives, paper waxing and waterproofing machines and scores of other installations, this new electric automatic control has increased production, cut the percentage of inferior goods and economized on fuel and raw materials, it is claimed.

Accurate synchronization of a series of machines or of different parts of a single machine is claimed as the basis of these production economies.

Identical with the electric automatic control in every detail except the switch, the electric remote control shown herewith, is intended to put production regulation at the machine operator's finger tips. Adaptable to any type of machine, this control is especially advantageous where the driving unit is at a distance from the operator as on paper box machines, elevators, and traveling ovens where control stations may be located at inspection windows.

Either type of control may be mounted on Reeves Transmissions now in use and their operation requires no special skill.

STATEMENT BY THE STEPHENS-ADAMSON MFG. CO., AURORA, ILL.

Demands for compact drives and variable speeds has been the urge behind the new self-contained drive just developed by Stephens-Adamson Mfg. Co. of Aurora,

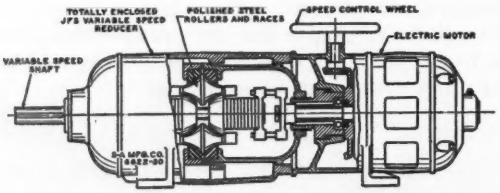


FIG. 5. STEPHENS-ADAMSON MFG. CO. JFS VARIABLE SPEED CHANGER COMBINED WITH AN ELECTRIC MOTOR

Ill. This new unit is a variable speed drive, complete in every sense of the word, consisting of variable speed reducer, electric motor and control entirely contained in one housing.

The new self-contained drive consists of a standard "JFS" variable speed reducer mechanism with the housing redesigned to take the body of an electric motor of standard make. The motor armature shaft is extended and forms the high speed shaft of the speed changer. In this way, the usual flexible coupling and base plate are eliminated and approximately 25 per cent of the total length and weight are saved.

The hand wheel normally used to increase and decrease the output speed of the standard JFS transmission has been replaced by a bevel gear. This is turned in either direction by means of a bevel pinion inside the housing and the small hand wheel mounted on top of the unit as shown in the illustration.

Power can be obtained at an infinite number of speeds by turning the hand wheel, which moves the two outer races nearer or farther apart on the longitudinal axis. As the two outer races approach each other, the three rollers are forced nearer the center and in turn force the two inner races apart against heavy springs which maintain the necessary tractive pressure between surfaces.

In this way the reduction ratio can be varied to deliver the power at any speed within the limits of the machine. Where it is desirable to limit the range, stops are placed to limit travel of the races. The mechanism is entirely enclosed and, operating in oil, it requires no lubrication beyond maintaining the proper oil level.

The manufacturer states that, in addition to the standard JFS transmission (transmission only), the new complete-drive unit is to be made in sizes to deliver from ¼ to 7.5 hp. and that with a 1200-r.p.m. drive motor a variable speed range of from 120 to 720 r.p.m. or 24 to 144 r.p.m. is practicable.

STATEMENT BY THE WESTINGHOUSE ELEC. & MFG. CO., E. PITTSBURGH, PA.

A new line of Westinghouse-Nuttall speed reducers for general industrial purposes includes single and double reduction types with shafts arranged in the horizontal plane, as has been announced by the Westinghouse Elec. & Mfg. Co. Each type is made in 13 sizes ranging in capacity from 1 to 365 hp. With single reduction units 13 different standard ratios ranging from 2.82:1 to 9.5:1 are afforded. Double reduction units provide 15 different standard ratios ranging from 11.8:1 to 70.5:1.

Highly efficient power transmission is obtained in these units due to single helical gearing and anti-friction

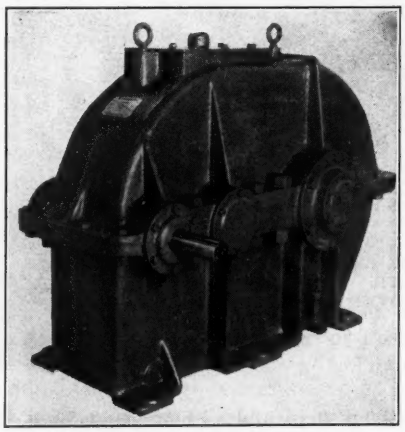


FIG. 6. ONE OF THE NEW WESTINGHOUSE ELEC. & MFG. CO. SPEED REDUCERS.

bearings on all shafts. Lubrication to gearing and bearings is supplied by a positive splash system. Bayonet type gages on the exterior of units affords an easy method of checking oil supply in cases. For these units, a complete line of welded steel bedplates are available.

Chains, Couplings, Bearings Belts, Short Center Drives

STATEMENT BY CUTLER-HAMMER, INC., MILWAUKEE, WIS.

MORE CONSISTENT and better operating characteristics, easier installation, greater safety, and easier access to parts which may have to be renewed, are features of a new line of magnetic clutches announced by Cutler-Hammer, Inc. These new clutches are known as the Type L, because of the shape of the armature, the cross-section of which is L shaped so that it fits around the magnet coil. This gives a greater and more steady magnetic pull throughout the life of the lining.

The magnet coil is wound on a sheet metal form and vacuum impregnated before it is inserted in the field

member. The coil is locked in place by means of four mounting studs which extend through the field casting. Loosening the four studs allows removal of the entire coil. All coil terminals are recessed below the surface of the field member to protect them against damage.

A centering bearing, which is a roller bearing mounted in the field member and which protrudes so that it fits into a recess in the armature hub, forms a common support for both clutch members, yet allows either member to revolve independently of the other, when disengaged. Perfect alinement and concentric engagement of the members is thus assured.

A definite improvement has been made in the design of the collector rings for these clutches. The collector rings are made of brass to prevent corrosion and are

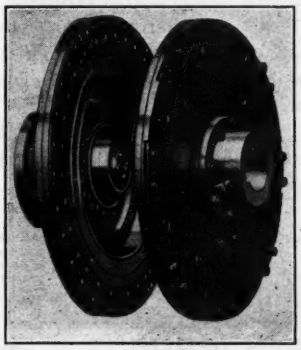


FIG. 1. ONE OF THE NEW TYPE L MAGNETIC CLUTCHES OF CUTLER-HAMMER, INC.

mounted away from the hub, on four insulated studs, so that it is practically impossible for sufficient dust to collect to cause creepage between the rings. Two carbon brushes are used on each collector ring so that one brush is always in position to give good contact without arcing. A lining wear indicator shows the operator when the lining has worn to a point where it must be readjusted.

Statement by The Dayton Rubber Mfg. Co., Dayton, O.

The Dayton Rubber Mfg. Co. announces that it has just completed negotiations with The Roderwald Co. of Berlin, Germany, for the manufacturing and distributing rights in North, South and Central America of the new and revolutionary Vee shaped Link-Wedge belt.

The Link-Wedge belt is constructed of fabric and rubber and was perfected by Herr Roderwald after ten years of experimentation. It is of Vee type construction with integral cogs on the inside and runs on a standard Vee shaped pulley. The outstanding feature is that this Vee belt is adaptable, flexible and adjustable to any length desired. A metallic clamp is used to join the ends.

The new Link-Wedge belt will greatly augment the present line of endless Vee belts and throws open to us such large fields as line shaft drives, railway pullman and passenger car lighting systems, as well as practically every branch of industry on power drives from fractional to thousands of horsepower, which cannot use our endless belts.

Germany has already adopted it as standard on its railroads above 1200 w., and it is in use there on some 2000 cars. It has also been installed on the giant Dornier X airship seating 162 persons, which is now planning a trip across the Atlantic to America. Also on some of the equipment on the steamships Europa and Bremen which have been vying with each other for ocean speed records.

The belts are likewise being applied on cars of the Canadian railroads. In this particular service it is used as a flexible drive for the lighting system, and in connection with the belting a special patented flexible drive assembly is used which serves the double purpose of relieving the jars and bumps, and holding the tension of the belt taut. These assemblies will be furnished by The Dayton Rubber Mfg. Co. but will be made in plants specially fitted for their manufacture.

Statement by The Jeffrey Mfg. Co., Columbus, O.

To resist the severe wear encountered by chains and buckets in the handling of abrasive materials, the Jeffrey Mfg. Co., after thorough laboratory and field tests, recently placed on the market a new line of Supermal chains and buckets.

Processing of malleable iron to give it combined characteristics of extreme hardness and toughness for special purposes has been a practice with The Jeffrey Co. for more than 20 yr. The modern industrial requirements for metals of higher wearing value and greater strength caused them to apply the process more generally. Its use in connection with malleable chains and malleable buckets began five years ago. The perfected metal is now being offered to all industries under the registered trade name of Supermal. Supermal embodies greater resistance to wear, higher tensile strength and a higher

FIG. 2. JEFFREY MFG. CO. SUPERMAL BUCKET CRUSHED TO SHOW DUCTILITY OF THIS NEW METAL

elastic limit than heretofore developed in malleable iron. It is claimed to be file hard—it cannot be touched on the surface with the flat of a file, yet it retains those desirable qualities of malleable iron, toughness and ductility.

The qualities of wear resistance, high tensile strength and high elastic limit found in Supermal chains compare favorably with like qualities of manganese steel chains. The Jeffrey Co. states that the cost of Supermal is only little more than that of ordinary malleable chains and substantially less than that of manganese chains. Characteristics of Supermal are: yield point, 51,000 lb. per sq. in.; ultimate strength, 65,000 lb. per sq. in.; elongation per cent in 2 in., 8.0; Brinnell hardness number, 180-200.

The file hard surface of these buckets does not produce a brittle material even in thin sections, it is claimed, and these buckets can be pounded and distorted far beyond any working requirements before breaking.

The illustration shows a Supermal elevator bucket after it had been pounded out of shape with a 15-lb. sledge. Chains and buckets of Supermal, it is stated, will withstand severe shocks and fatigue loads without breaking.

Supermal is recommended for conveyors, elevators and chain drives subject to abrasive or gritty conditions. It is also recommended for chain drives where something harder and stronger than standard malleable iron is required to withstand severe usage. Supermal chains, attachments and buckets can be furnished in all standard sizes.

STATEMENT BY THE LINK-BELT CO., CHICAGO, ILL.

Link-Belt Co. announces the development of a new steel drive chain which will be known as Link-Belt Hyper Chain. The chain is made from alloy steel, heat

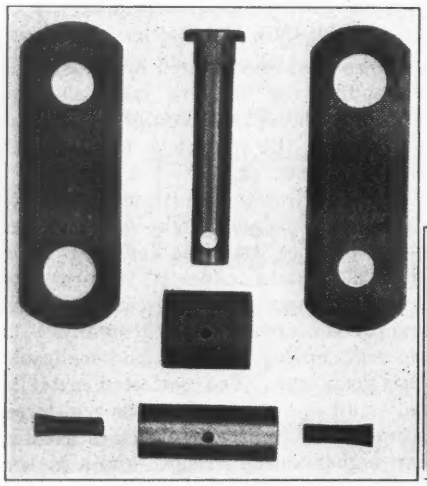


FIG. 3. PARTS OF THE LINK-BELT CO. NEW HYPER CHAIN

FIG. 4. TYPICAL LINK-BELT CO. PROMAL CHAIN LINK

treated, and uses a new type of pin and cotter. The pins, bushings and holes in side bars are accurately ground. The cotters are of a special type (patent applied for) and are so designed as not to work loose when once inserted and swelled into the holes provided in the pins for their reception. The new chain combines great strength with durability. The Link-Belt Hyper SS-40 Chain has an ultimate strength of 75,000 lb. and the Link-Belt Hyper SS-124 Chain, an ultimate strength of 150,000 lb. The manufacturing tolerances to which Hyper parts are held are extremely fine, 0.001 in., which insures press fits of the highest order and such fits result in a durable chain. The chain was developed to meet a growing need for a stronger and more durable type of chain for heavy positive power transmission.

Another new line of cast chains showing remarkable strength and durability in comparison with malleable chains has also been placed on the market by the Link-Belt Co., Indianapolis. These chains are sold under the registered trade name of Promal. They are the result of extended research to provide longer life for drive and conveyor chains operating under heavy loads or abrasive conditions. Experimentation with cast chain metals, started about four years ago, led to the discovery of a new method of processing malleable iron which so altered its physical characteristics as to make it a distinctly new metal. This fact was recognized by giving it the distinctive name of Promal.

Compared with malleable iron, Promal has an average yield point of 45,000 lb. as against 36,000 lb.; an average ultimate strength of 65,000 lb. as against 54,000 lb.; an average elongation of 14 per cent as against 18 per cent; and a Brinnell hardness of 170-190 as against 110-130. Compared with mild cast steel, annealed, Promal has an average yield point of 45,000 lb. as against 34,000 lb.; an average ultimate strength of 65,000 lb. as against 60,000 lb.; an average elongation of 14 per cent as against 26 per cent; and a Brinnell hardness of 170-190 as against 120-140. Promal thus has to a high degree the qualities desirable in sprocket chain material; great toughness to resist extreme tension without permanent stretch; high strength in proportion to weight and size; and hardness that affords great resistance to abrasive wear. The combination of these characteristics in the new metal gives chains made of it their surprising durability.

Due to their higher Brinnell hardness, Promal chains withstand abrasive wear far better than the usual cast

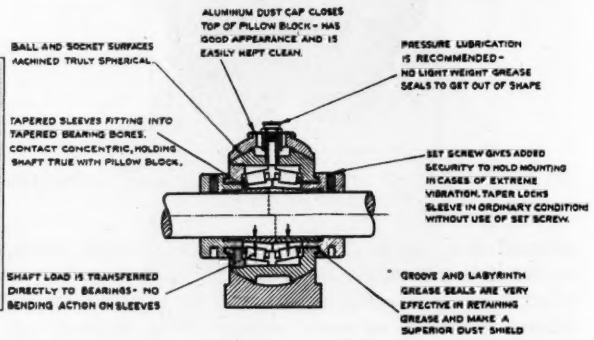

ALUMINUM DUST CAP CLOSES TOP OF PILLOW BLOCK - HAS GOOD APPEARANCE AND IS EASILY KEPT CLEAN.
BALL AND SOCKET SURFACES MACHINED TRULY SPHERICAL.
PRESSURE LUBRICATION IS RECOMMENDED - NO LIGHT WEIGHT GREASE SEALS TO GET OUT OF SHAPE
TAPERED SLEEVES FITTING INTO TAPERED BEARING BORES. CONTACT CONCENTRIC, HOLDING SHAFT TRUE WITH PILLOW BLOCK.
SET SCREW GIVES ADDED SECURITY TO HOLD MOUNTING IN CASES OF EXTREME VIBRATION. TAPER LOCKS SLEEVE IN ORDINARY CONDITION WITHOUT USE OF SET SCREW.
SHAFT LOAD IS TRANSFERRED DIRECTLY TO BEARINGS - NO BENDING ACTION ON SLEEVES
GROOVE AND LABYRINTH GREASE SEALS ARE VERY EFFECTIVE IN RETAINING GREASE AND MAKE A SUPERIOR DUST SHIELD

FIG. 5. CROSS SECTION OF THE LINK-BELT CO. TIMKEN BALL AND SOCKET PILLOW BLOCK

chain. It is also worthy of note that Promal has an exceptionally high yield point or elastic limit (25 per cent higher than that of average malleable iron) which engineers recognize as of greater importance than ultimate strength. In addition to having this high yield point Promal metal is tough and ductile so that it withstands shock and fatigue loads. High temperature reduces its tensile properties somewhat, but temperatures up to 1000 deg. F. will not cause it to become brittle.

Promal chains, a typical link of which is shown above, are particularly recommended for four general classes of service: chain drives, elevators and conveyors operating under gritty or abrasive conditions; chain drives where greater strength is required than the corresponding size of malleable iron chain provides; drag, scraper and flight conveyors where the chain drags and is subject to abrasion; and heavy duty drives of comparatively high speed, short centers and large sprocket ratios.

During the year, Link-Belt Co. also announced its Timken anti-friction ball and socket pillow block. Designed several years ago, it has been improved and perfected in the meantime, and has been actually service-proved (or tested) in practically every type of service. These pillow blocks are designed to fit any good grade

of commercial shafting, from $1\frac{7}{16}$ in. diameter to the largest size, without special fittings or the use of appliances. Because these pillow blocks use pressure lubrication, they are practically dust tight. The grease is forced in at the center and out at the shaft openings, thus, with the addition of the grease seal at the top, dust and grit are kept out of the bearing. The grease stays inside the bearing, where it belongs.

STATEMENT BY THE MORSE CHAIN CO., ITHACA, N. Y.

One of the interesting recent developments of the Morse Chain Co. is in connection with the Morse silent

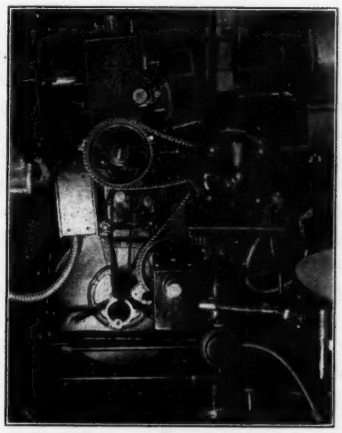


FIG. 6. MORSE CHAIN CO. CHAIN DRIVES APPLIED TO TALKING MOVING PICTURE MACHINES

chain drive on talking moving picture machines where positive synchronization and quietness are essential throughout the lifetime of the equipment where operation often runs as high as 4380 hr. yearly. The photograph shows the view of one of these machines, this particular one being equipped with two drives, one from the motor to the sound head and one from the motor to the phonograph. Several different designs have been used, but the most popular has been with a driver sprocket of $\frac{3}{8}$-in. pitch, 15 teeth and a diameter of $1\frac{3}{4}$ in. The driven sprocket has 58 teeth, is approximately 7 in. in diameter and uses a $\frac{3}{8}$-in. pitch chain $\frac{1}{2}$ in. wide.

STATEMENT BY THE WORTHINGTON PUMP & MACHINERY CORP., NEW YORK, N. Y.

During the year, the Worthington Pump & Machinery Corp. has introduced a Multi-V-Drive for power transmission. This drive which is positive, flexible, reliable, quiet and economical, consists of a number of endless V-belts running in V-grooved sheaves, and combines a new, long-life type of rubberized cord V-belt impervious to dust and moisture with an improved V-groove sheave. This combination gives a positive grip without binding or backlash, which actually transmits about 99 per cent of the applied power, at high speed ratios over short centers without idlers. One of these drives used in connection with an air compressor is shown by the photograph.

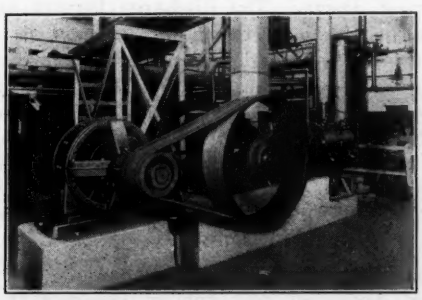


FIG. 7. NEW MULTI-V-DRIVE OF THE WORTHINGTON PUMP & MACHINERY CORP.

Methods of Increasing Cycle Efficiency

DURING THE LAST two decades, great strides have been made in increasing the efficiency of the power cycle. Thermodynamically the means of increasing the efficiency has been known for many years but it was not until recently that metals and machine designs were available to make them practical.

Foremost among the methods of increasing the efficiency of the prime mover was the obtaining of lower exhaust temperatures, that is, higher vacuum. Next came higher initial temperatures by using higher superheat, these using higher pressures and finally resuperheating or reheating, that is, expanding the steam to some intermediate pressure in one turbine cylinder and then superheating it again before expanding to the final exhaust or condenser pressure.

Extracting of steam from the turbine has also added to the efficiency of the modern plant. By using an infinite number of extraction points, this extraction or regenerative cycle as it is sometimes called would equal the ideal Canot cycle efficiency. In practice, the number of heaters is limited and so far five stages of extraction is the maximum used. Another method of cycle known as the binary vapor cycle has also been experimented with. In the best known plant of this type, mercury and steam from the two vapors used. Mercury vapor is made in a pulverized coal fired boiler. This vapor is expanded through a mercury turbine and is then exhausted to a combination condenser and boiler. The mercury vapor is condensed and generates steam which is then used in a conventional condensing turbine.

NIEDERRHEINISCHE Bergwerks Gesellschaft has recently placed a contract with the Siemens-Schuckert Works of Berlin, for the construction of a steam turbo-compressor set for its coal mines at Neukirchen, Germany. The compressor, which is being built by the Demag Co., is being designed for normal and maximum outputs of 1,060,000 and 1,270,000 cu. ft. per hr. at normal and maximum final pressures of 85 and 100 lb. per sq. in. The turbine which is to be direct coupled to the compressor is of 3640 hp. and designed to run at 4150 r.p.m. The machine is to operate with steam at a normal pressure of 142 lb. per sq. in. and a temperature of 527 deg. F.; it is designed to be capable of working with steam at 230 lb. pressure and 662 deg. F.

THEORY OF PERFECT combustion is well understood and widely known but the knowledge is not always applied in practice. Improvements in instruments have added a great deal to the intelligent use of fuel and steam. An analysis of plant performanee is possible only by data taken simultaneously in a number of places throughout the plant and in the average plant this is made practical only by the use of recording instruments.

Industrial Heating Equipment

Unit Heaters, Heat Exchangers and Temperature Control

STATEMENT BY THE AMERICAN BLOWER CORP., DETROIT, MICH.

NEW VENTURAFIN Unit Heaters in sizes 16, 18, 22, 24, 26 and 28 have been added to its line by the American Blower Corp. during the past year.

STATEMENT BY THE AUTOMATIC TURBO HEATER CO., CHICAGO, ILL.

Recently the Automatic Turbo Heater Co. brought out a turbine driven unit heater of the centrifugal multi-fan type. Principles embodied in the design are entirely new as far as the driving end is concerned. Steam is led to the turbine at from 10 to 150 lb. pressure and used in the turbine to develop power to drive the fans. All the steam going through the turbine is then led to the condenser coils and condensed where the heat of the steam is given to the air. The advantages obtained from this arrangement are: Power to drive the fan is obtained for practically nothing as compared with electric drive and electric wiring is eliminated, making the initial cost cheaper. The unit is simple and foolproof, reduces fire hazards and adapts itself to all types of flexible control.

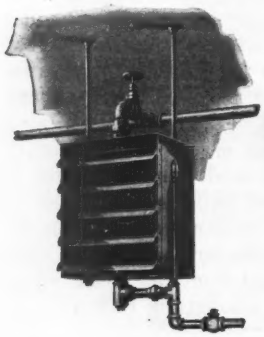


FIG. 1. AMERICAN BLOWER CO. NEW VENTURAFIN UNIT HEATER

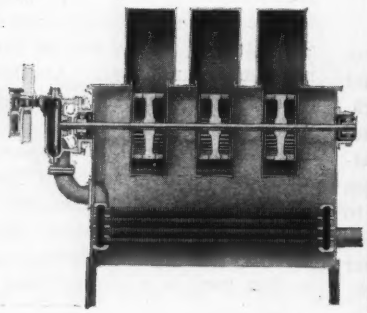


FIG. 2. THE STEAM TURBINE DRIVEN UNIT HEATER OF THE AUTOMATIC TURBO HEATER CO.

STATEMENT BY THE BUFFALO FORGE CO., BUFFALO, N. Y.

The Buffalo Gas Heater, a unit heater that burns gas, is a recent development of the engineering department of the Buffalo Forge Co. to furnish clean, safe and comfortable heat for industrial installations. In many cases the gas heater has distinct advantages, such as: low initial cost, eliminating boiler room fuel storage and auxiliary equipment; light, compact and easily suspended; low labor cost for upkeep; cleanliness, with no ash, dust or smoke; automatic temperature control easily applied, and admirably considered as a booster unit to assist the present heating system, take care of new additions or cold corners. The maximum heat input is 150,000 B.t.u. per hr. and, using a gas of 900 B.t.u. value, approximately 160 cu. ft. of gas per hr. is required for the above input. Heaters can be furnished for single phase, three phase and direct current, 110 or 220 v. and automatic controls can be furnished with any of the foregoing units. Temperature regulation is optional.

Another new development of this company is a new model B Breezo-fin unit heater as illustrated. These new models are efficient, light in weight and pleasing in appearance. The casing is die-stamped and welded with reënforced corners. Simple clip hangers are furnished as standard equipment. The fan is an efficient die-stamped design. The discharge louvers are separately adjustable and the heater element is Aerofin, made of brass tube and copper fin, non-corrosive and highly efficient. Heaters are suitable for any steam pressure from 2 to 250 lb. and this model is manufactured in eight sizes, permitting a selection not only for size but also for air capacity and final temperature.

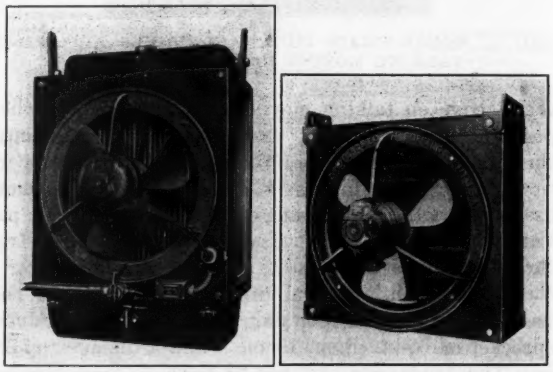


FIG. 3. BUFFALO FORGE CO. GAS FIRED UNIT HEATER (LEFT) AND THE NEW MODEL B BREEZO-FIN UNIT HEATER (RIGHT)

STATEMENT BY THE COPPUS ENG. CORP., WORCESTER, MASS.

Recently a new fractional horsepower steam turbine has been developed and put on the market by the Coppus Engineering Corp. The turbine is designed

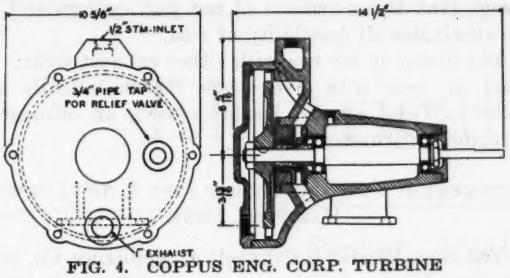


FIG. 4. COPPUS ENG. CORP. TURBINE

primarily for unit heater drive but is equally applicable to other units requiring an economical fractional horsepower prime mover. The purpose of its development is to eliminate the objection of high initial cost as compared with electric motor drive. Its advantages are obvious since it eliminates electric current costs and accessories necessary to motor drive.

By using high pressure piping up to the steam turbine instead of large diameter low pressure piping, the cost of the steam line is noticeably reduced. Greater reliability and flexibility of operation are other advantages.

In the case of unit heaters, high-pressure steam is supplied and the exhaust steam is used in the heater.

The Coppus fractional horsepower steam turbine is so designed that it always uses for its operation less steam than the unit heater can condense under the worst conditions. For this reason no excessive back pressure can be built up. A small bleeder connection has to be provided from the live steam supply line of the steam turbine into the exhaust connection, leading from the steam turbine to the unit heater. If a properly adjusted reducing valve of small size is installed in this bleeder line, a constant predetermined exhaust pressure will be maintained in the unit heater.

STATEMENT BY THE GEBHARDT CO., CHICAGO, ILL.

Heat exchangers designed to obtain high rate of heat transfer are announced by The Gebhardt Co. Metals used throughout are copper and bronze, so that they are not affected by liquids containing acids or alkaline. They also insure an absolute freedom from electrolysis.

Each tube is used to its full capacity. This is accomplished by a flat spreader plate valve placed at the receiving end of each element, machined on the inner face to insure a water-tight joint against the flue sheet. The holes in the valve are of the same size as those in the tubes. External adjustment of this valve is effected by the bronze screws through the end castings. This plate valve can be made to open up or close down the tube openings so that the total area exposed will be equal to the supply demand. This insures uniform flow and full advantage of the total transfer surfaces, thus allowing the units to be of minimum size.

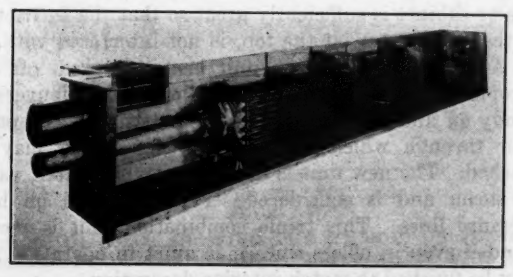


FIG. 5. THE GEBHARDT CO. HEAT EXCHANGER

Hot drain water is made to run counterflow to the incoming process water. The exchanger element is provided with vertical baffles with alternate openings top and bottom to insure the full cross flow, thus eliminating the formation of air globules on the surface of the tubes. These air globules have an insulating property and cut down the efficiency.

Its compactness and free accessibility to all parts make it very easy to keep the copper tubes free from black scale and grease. Cleaning is done with a special soft wire brush and a special solvent. This exchanger may be placed anywhere, under the floor, on the floor or on the roof in either concrete or wooden containers. If placed above the natural drain the waste hot water is pumped through the exchanger. When placed under the floor the container cover is comprised of reënforced concrete slabs designed for any load condition. The exchanger is well adapted for laundry and power plant or industrial service.

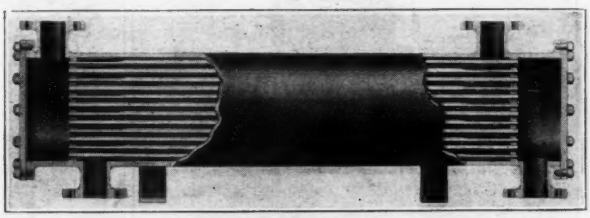


FIG. 6. EQUAFLO HEAT EXCHANGER OF THE GRISCOM-RUSSELL CO.

STATEMENT BY THE GRISCOM-RUSSELL CO., NEW YORK, N. Y.

To overcome baffle difficulty and to increase the amount of surface in a given size of shell, The Griscom-Russell Co. has designed, and applied for patent on, the G-R Equaflo Exchanger.

Heretofore baffles have usually been considered essential in heat exchangers to secure intimate contact between the liquid in the shell and the outside of the tubes. Such baffles many times cause collections of dirt, which at best is difficult to remove.

Distinctive feature of this apparatus is the use of tubes swaged down at one end, to permit closer spacing of the tubes in the shell and, at the same time, to retain sufficient bridge wall in the tube sheets for strength.

The resulting design development of this unit is the elimination of cross baffles in the shells. In fact, the exchanger receives its name Equaflo because the tubes are so spaced in the shell that the area of flow through the shell may be equal to the area of flow through the tubes. This result is the ideal that has always been striven for by heat exchange designers.

The G-R Equaflo Exchanger is applicable to heat exchange between any two liquids or for use as a condenser or cooler. It is furnished in various arrangements and materials for different service requirements. This apparatus should be of particular interest to engineers and superintendents of petroleum refineries, natural gasoline recovery plants, chemical plants and similar service.

STATEMENT BY THE MARSHALL HEATER CO., DAYTON, O.

Latest among the developments of Marshall Heater Co. is a hot water heater designed for power laundries and shown below. It is designed especially for plants using soft water. The heater both internally and externally is constructed of heavy solid copper making it absolutely rust and corrosion proof.

The average laundry is troubled with rust in steel heaters when soft water is used due to fact that water temperatures are seldom carried higher than 180 deg. F. with the result that the free air is not expelled and will attack the steel. Copper is not attacked by free air hence this new heater overcomes that trouble. The storage tank is constructed of red gulf cypress and this also eliminates all possibility of rust.

The device is for use with either exhaust steam, live steam or both with live steam thermostatically controlled. When exhaust steam is used, an efficient oil extractor is furnished.

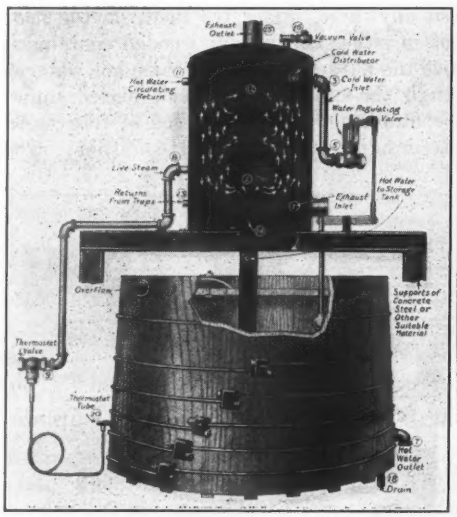


FIG. 7. RUST PROOF HOT WATER HEATER OF THE MARSHALL HEATER CO.

FIG. 8. NEW CABINET UNIT HEATER OF THE WOLVERINE TUBE CO.

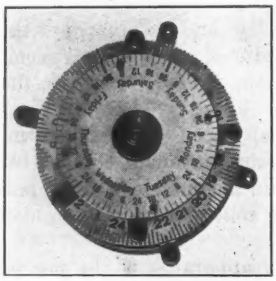
STATEMENT BY THE STAT-AMATIC INST. & APPLIANCE CO., HARTFORD, CONN.

The Stat-Amatic Instrument & Appliance Co. offers a system of zone temperature regulation to industrial plants which makes it possible to maintain a healthful working temperature during the day and an economically lower temperature at night and over week-ends and holidays. This equipment is completely automatic, even to the master control clock which is wound by a small electric motor.

Factory buildings are divided into zones, and a dual thermostat is placed at a strategic point in each zone. Each thermostat controls a motorized steam valve which is placed in the steam line which feeds each zone. Then one master control clock with program dial is placed in the engineer's office (or some other convenient place), and this clock automatically shifts each thermostat in each zone from the high day temperature to a lower night level at predetermined hours each day in the week.

When Saturday noon arrives, the program dial takes control, and shifts all of the thermostats over to the low level, and holds them at the low level until a predetermined hour Monday morning. This is all done entirely automatic, without human thought or attention.

Several holidays occur during the heating season, and it is, of course, desirable to lower the temperature on these days. If, for example, a holiday comes on Wednesday, the temperature may be held at the low level over this day by simply inserting two pins (provided for that purpose) in the program dial.



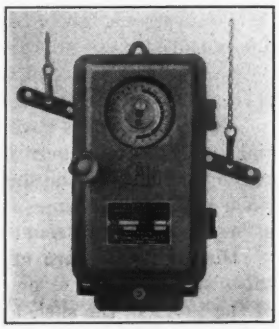


FIG. 9. TEMPERATURE CONTROL EQUIPMENT OF THE STAT-AMATIC INSTRUMENT & APPLIANCE CO. PROGRAM DIAL (TOP LEFT), DUAL THERMOSTAT, MOTOR WOUND MASTER CONTROL CLOCK (TOP RIGHT), AND DUAL THERMOSTAT (LEFT)

STATEMENT BY WOLVERINE TUBE CO., DETROIT, MICH.

Among recent developments of the Wolverine Tube Co. is a cabinet unit heater of novel design, as shown by above. It provides an intake through the wall of the building as an alternate source of air. A straight, square damper permits either one or both air inlets to be used at the same time. Summer ventilation with outside air is therefore possible as well as winter ventilation with inside air.

Immediately above the air inlets is a steel wool air filter. This is readily removable for cleaning. Flying dust which has been counted as a disadvantage of forced circulation is thereby eliminated. Likewise the air filter is of great utility in commercial and industrial sections when outside air is desired. The capacity of the vertical flue or cabinet is sufficiently great so that the full action of the unit heater, at the top, is not interfered with.

A standard Wolverine unit heater is used. It has aeroplane-type fan, individually adjustable louvers, a handy off and on switch. The cabinet has a flush, panel door through which the motor of the heater may be reached. The new unit is designed for hot water, vapor or steam and is considered serviceable even on high pressure lines. This triple combination unit is recommended even in offices since it is quiet in operation and may be finished to match interior decoration.

Electrical Equipment

Circuit Breakers, Switchboards Panels, Lighting Systems, Lightning Arresters and Instruments

STATEMENT BY THE ASSOCIATED ENGINEERS CO., CHICAGO, ILL.

NEW METHODS and equipment have been developed by the Associated Engineers Co. for identifying phases on cables which will eliminate some operations, reduce the operating hazards and shorten the time on the work. The scheme is briefly as follows: The devices which have been developed consist of end plates inclosing copper plates which are coated with oxide, known commercially as Cuprox. These elements have a pronounced valve action, permitting current to flow readily in one direction but up to certain small voltages, preventing this flow in the opposite direction. As made, three elements are connected in series on each device having a breakdown strength of approximately 50 v., above which they act as solid copper connections. These devices, when connected in series between the line conductors and ground, permit the use of polarized testing equipment of nominal voltage to be used in making the proper identification of cable but in the event of accidental contact of the line with a source of potential prevent this potential rising to a dangerous value on the conductors on which the men may be working. The method of operation is as follows:

At each end of the line or circuit, A phase will be solidly grounded, and B and C phases will be grounded through the new phase flashing devices. These devices will be reversed with respect to each other on the two phases so that current in a positive direction only can flow from the conductor to ground on B phase and in the negative direction only on C phase. After the line has been cut in the manhole, the foreman with a small battery having the leads properly marked for potential and a lamp will check between lead and the several coppers. On A phase, he will get a full lamp with the leads connected in either direction. On B phase, he will get a lamp only when the positive lead is connected to the copper with the negative on the sheath; and on C phase, only when the negative lead is connected to the copper with the positive on the sheath. After the conductors have been reconnected, the foreman will make a re-check with his battery and lamp outfit, and if the proper connections have been made on the cable, he will receive the same indications as before.

This method has desirable advantages over the present method in that it is necessary for the station electricians, substation operators and overhead troublemen to work on the line switches or potheads only once at the start of the work, or once again upon completion of the work. No further assistance to the cable men is needed. In addition to avoiding two switching operations and the flashing of phases by station electricians, substation operators and overhead troublemen, with the attendant hazards, from one to two hours' time will be saved in completing the cable work; therefore, in restoring cables to service after a failure. This method also makes a reduction of 12 in the number of telephone calls between the foreman, load dispatcher, station electricians, substation operators and overhead troublemen.

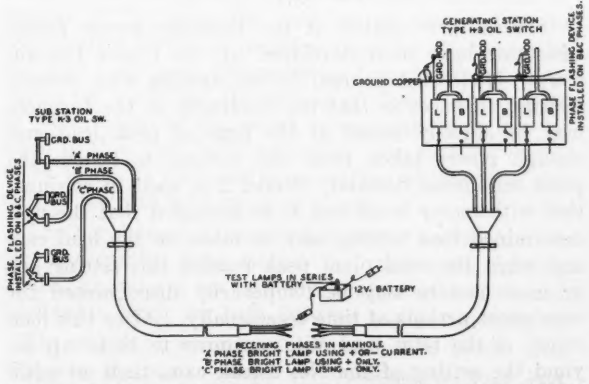

GENERATING STATION
TYPE H-3 OIL SWITCH
GROUND COPPER
SUB STATION
TYPE H-3 OIL SW.
GRD. BUS
'A' PHASE
'B' PHASE
'C' PHASE
PHASE FLASHING DEVICE INSTALLED ON B & C PHASES
TEST LAMPS IN SERIES WITH BATTERY
12V. BATTERY
RECEIVING PHASES IN MANHOLE
'A' PHASE BRIGHT LAMP USING + OR— CURRENT.
'B' PHASE BRIGHT LAMP USING + ONLY.
'C' PHASE BRIGHT LAMP USING — ONLY.

FIG. 1. DIAGRAM SHOWING THE METHOD OF FLASHING PHASES FROM TRANSMISSION LINES WITH THE ASSOCIATED ENGINEERS CO. EQUIPMENT

STATEMENT BY THE ALLEN-BRADLEY CO., MILWAUKEE, WIS.

Complete line of overload breakers for fractional horsepower d.c. and a.c. single-phase and polyphase motors is announced by the Allen-Bradley Co. The

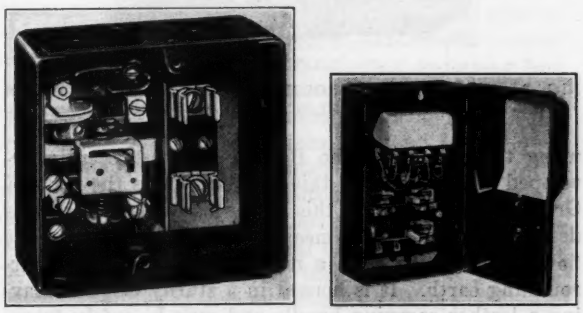


FIG. 2. ALLEN-BRADLEY CO., BULLETIN 825 OVERLOAD BREAKER (LEFT) AND BULLETIN 719 OIL BURNER CONTROL PANEL (RIGHT)

tremendous number of small individually driven tools and devices used in shops, stores and homes, such as machine tools, pumps, compressors, fans, refrigerating machines, etc., has necessitated the development of these Bulletin 825 Overload Breakers. Reliable protection is afforded against motor burnouts and damage to the device due to overloads. They have a maximum rating of 1 hp., 125 v., and 1½ hp., 220 v., and may be obtained with or without snap switch or fuse clips. Six forms satisfy all industrial applications. Another development is the Bulletin 719 Oil Burner Control Panels designed to operate in conjunction with standard safety shunting controls where the oil burner controls lack sufficient current carrying capacity to switch the motor current. The panels consist of an assembly of a standard contactor with relays, all of which items have demonstrated their reliability throughout many years of service in every type of industrial control application. The Bulletin 719 panels are for alternating-current motors only, of the following ratings: Single phase, 1½ hp. 110 v., 3 hp. 220 v. Polyphase, 3 hp. 110 v., 5 hp. 220 v., 7½ hp. 440-550 v. For 440 and 550-v. motors, a step-down transformer for the switch coil is required.

STATEMENT BY THE AUTOMATIC SWITCH CO., NEW YORK, N. Y.

In addition to the heavy-duty solenoid valve, this company has also brought out a new line of heavy-duty emergency lighting and power switches, designed to connect power and lighting circuit emergency feeders automatically in case of failure of the regular supply.

STATEMENT BY THE BORDEN ELECTRIC CO., NEWARK, N. J.

Considerable attention is being paid to ground resistance values at the present time, and to meters for measuring these values. The Borden Co. has recently developed a new meter of this kind known as the Type E Groundometer. While this meter has other uses, it is designed especially for measuring the resistance to the flow of electricity from a metal electrode into the surrounding earth. It is housed in a sturdy oak case having a leather carrying handle and may be safely transported with other tools and equipment, in a line construction truck.

FIG. 3. THE TYPE E GROUNDOMETER OF THE BORDEN ELEC. CO.

The meter is, fundamentally, a Wheatstone bridge, which reads directly, that is, no calculations are required to find the resistance value of the electrode under test. It is fitted with a battery consisting of a single dry cell of the ordinary type used for bell service and has a telephone receiver to determine the point of balance. External binding parts are provided for the receiver so that an instrument such as a galvanometer, may be substituted for special purposes.

STATEMENT BY THE ELECTRIC MACHINERY MFG. CO., MINNEAPOLIS, MINN.

Development of a capacitor for Neon signs has been announced by the Electric Machinery Mfg. Co. Neon signs operate at power factors of from 45 to 50 per cent at a high voltage, usually obtained from the secondary of 110/15,000-v. transformer. A capacitor connected across the low-voltage terminals of the transformer counteracts the effect of the transformer reaction and greatly improves the power factor. Capacitors for this service must be rugged, liberally designed to withstand over-voltage surges and must have long life, all features that have been incorporated in these new units.

FIG. 4. ELECTRIC MACHINERY MFG. CO. CAPACITOR FOR NEON SIGNS

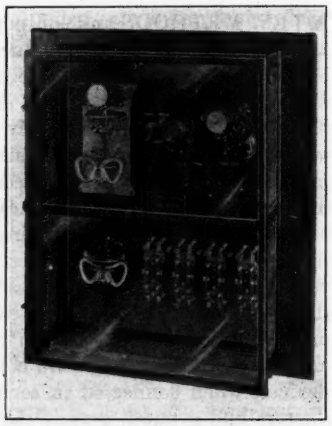


FIG. 5. A POWER DEMAND LIMITATOR OF THE POWER CONTROL CORP.

STATEMENT BY THE POWER CONTROL CORP., SYRACUSE, N. Y.

Several new models of the Edmoore power factor Limitator have been developed by the Power Control Corp. Model 1-A is used in conjunction with electric melting furnaces so that the electrodes in the furnaces may be slightly raised at the time of peak lead and enough power taken from the furnace to relieve the plant maximum demand. Model 2 is used in conjunction with motor loads and is so arranged that the predetermined load setting may be made on the load cam and when the total plant peak reaches this setting one or more motors may be temporarily disconnected for very short periods of time occasionally. After this load relief, if the total load still continues to build up beyond the setting of the No. 2 load cam, then an additional motor unit or combinations of units can be disconnected. At the beginning of the next succeeding

demand period, loads are reëstablished either automatically or manually as may be desired.

Model 3 is used primarily in conjunction with motor driven air compressors in such a way that if the total demand of the plant exceeds the setting of the Limitator, that the compressor will be unloaded. If the load drops below the Limitator setting, the compressor load is reestablished. In cases of five-step control on compressors, or where compressors are unloaded in several stages, the Limitator is arranged to unload automatically according to total plant load from full load to three-quarter, then to one-half, one-quarter and zero load. When the plant demand drops below the Limitator setting, the compressor is automatically reloaded in the reverse order. Where several compressors are installed, they are unloaded in sequence as well as the stages. If so desired, the equipment may be arranged so that the compressors will not be unloaded if the total air pressure drops below a dangerous point. This model is also used in conjunction with industrial heating loads, such as japanning, enameling ovens, heat-treating furnaces, etc., and by automatically disconnecting these loads at the time of plant peak the dangerous demands are headed off and excessive power bills avoided.

Model 4-B is used where power is purchased and also generated by an industrial plant and can be so adjusted as to maintain absolutely constant power on the control station companies lines and allowing the plant generator to take the fluctuations, or the reverse may be provided for.

STATEMENT BY THE SQUARE D CO., DETROIT, MICH.

The new Square D convertible safety panel permits power distribution with complete safety. It offers convenience, safety and convertibility in a power distribution panel. Chief among its many features is its switch action. Only the light weight switch blades are carried on the door and the switch element is so constructed as to give double break. All poles are ruptured simultaneously. There is no danger of its flashing over, breaking down or being in any way a hazard to the operator. It is guaranteed to rupture 50 per cent overloads and has, in laboratory tests, ruptured currents as much as 1000 per cent in excess of its rated capacity.

With the opening of the switch door, all parts are completely dead. Fuses, mounted on a fixed base, may be removed or changed without danger of coming in contact with live parts. Units are interchangeable in cabinets of the same size and are so arranged as to accommodate larger or smaller fuses by changing the fuse clips. All parts are accessible from the front. Provisions are made for the testing of fuses. Because of the construction of the switch element, the unit may be locked in "on" or "off" positions. The position of the switch blades is indicated by a marker visible from the front of the unit with the door closed.

Another Square D product, a meter service switch with combination fuse cabinet for range and lighting circuits, provides a compact and economical switch and distribution block for both lighting and range circuits.

The switch is wired to the branch fuse block. All wires for the meter loops are soldered in lugs and fastened to the switch ready for connection to the meter, insuring proper connection and eliminating expensive internal wiring. The main fuses and test jacks are accessible through the small door at the top which can be opened only with the switch in the off position.

The distribution cabinet consists of four 30-amp. circuits for lighting and one 60-amp. circuit for the electric range. The range circuit if provided with a safety pull-out fuse block, which has a Bakelite cover or holder and are arranged to come out with the holder.

The action also disconnects the circuit. The contact jaws are reversed below the surface making them absolutely safe (dead front).

STATEMENT BY THE WESTINGHOUSE ELEC. & MFG. CO., E. PITTSBURGH, PA.

Among the developments of the Westinghouse Elec. & Mfg. Co. during this last year may be listed the following:

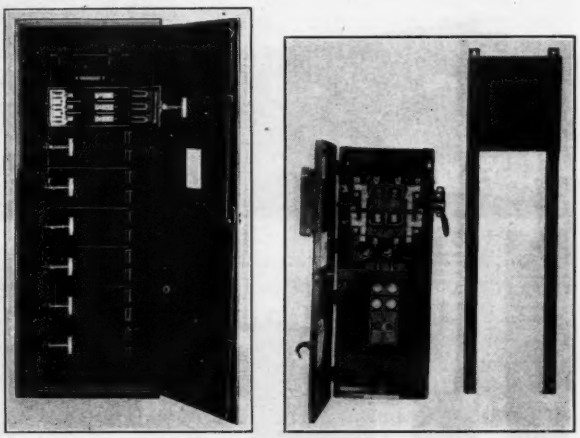


FIG. 6. CONVERTIBLE SAFETY PANEL OF THE SQUARE D CO. (LEFT) AND COMBINATION SWITCH AND FUSE PANEL (RIGHT)

The Westinghouse Visicode supervisory control system provides a means for remotely controlling, supervising and metering a large variety of power apparatus and operates over two telephone type line wires. In contrast to two-wire systems which previously operated on the basis of audible signals, it provides for the first time remote control with continuous, automatic, individual, visual lamp indications for each piece of remotely controlled apparatus over only two wires. Remote metering is also possible without the use of any extra line wires.

The Visicode is particularly applicable to the remote control of all kinds of small substations. Its applications cover a wide range varying from small, isolated substations to all kinds of transformer switching and distribution stations, automatic substations, such as those used in railway and mining work and automatic hydroelectric generating stations.

A number of remote stations may be operated on the same two line wires. The Visicode is thus particularly adaptable to applications where a number of remote stations are in the same general direction from the control point. Such applications include stations along an electrified railway system and electrified pipe line pumping stations such as used in pumping oil, gas, etc., over extended distances.

The Visicode is an all relay supervisory control sys-

tem using extremely simple telephone relays having uniform mechanical construction. The equipment is mounted on modern steel panels in a compact, readily accessible assembly. Operations are performed in a rapid, positive manner by means of coded impulses, thereby providing absolute protection against the possibility of false operations due to induced voltages from nearby high tension lines or by lightning. The Visicode provides a complete remote control system, which combined with a minimum line wire cost, now makes supervisory control economical for many applications which formerly did not justify its use.

Westinghouse miniature remote control switchboards represent one of the latest and most modern developments in the switchgear apparatus field. Miniature switchboards, as the name implies, make use of control switches, indicating lamps, meters, control wires, etc., which are relatively small in size as compared with the conventional switchgear control apparatus in general use today in large electric power and switching stations.

Modern trend favors the location of electric generating stations and their associated transmission substations at increasing distances apart. This condition presents an engineering problem wherein the usual forms of remote power control are inadequate and uneconomical for two reasons. First, the distance is too great to justify the cost of power control cables and long conduit runs. Second, the large amounts of power generated, if controlled by the usual switchboard, often results in an excessively large board. In many cases, although the distance is short enough to justify the use of power cables, the miniature switchboard finds a fitting application on the basis of its comparatively small size.

Miniature switchboards economically overcome these difficulties without sacrificing any of the functions provided by the conventional switchboard. Costly power cables are replaced by multi-conductor lead covered telephone cable. The size of the switchboard itself is effectively reduced and the control centralized by using telephone control switches and lamps of the type widely used for many years with supervisory control. Miniature low energy meters are used and provided with illuminated dials so that the smaller scales may be easily read. Miniature bus is readily applied to give the operator a physical picture of the circuits he controls. The control equipment may be mounted in any of a large number of arrangements including steel panels, steel benchboards, various types of desks and many special layouts.

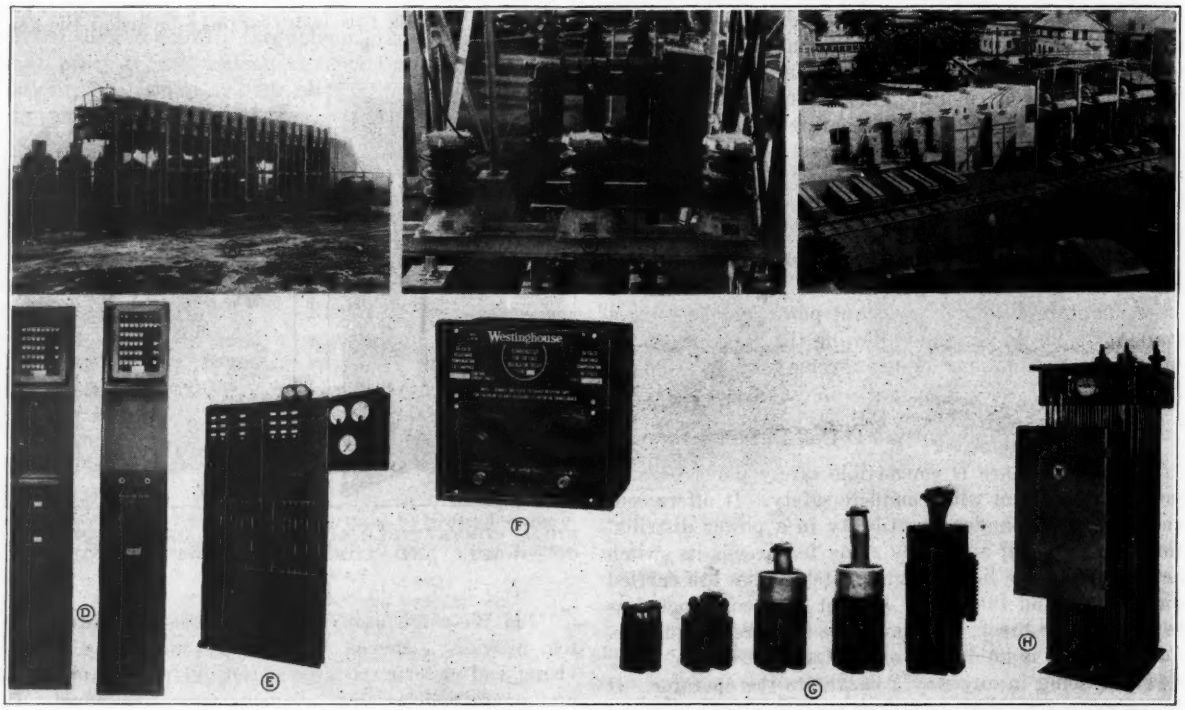


FIG. 7. NEW WESTINGHOUSE ELEC. & MFG. CO. EQUIPMENT. A, METAL CLAD SWITCH GEAR AT JOLIET STATION. B, NEW AUTO VALVE LIGHTNING ARRESTOR. C, SWITCHHOUSE CONSTRUCTION AT MILBURN STATION. D, VISICODE SUPERVISORY CONTROL SYSTEM EQUIPMENT. E, MINIATURE SWITCHBOARD. F, TYPE RS COMPENSATOR. G, DE-ION GRIDS FOR OIL CIRCUIT BREAKERS. H, TYPE S INDUCTION REGULATOR

In addition to a great number of standard switchhouses with breakers of 350,000 kv-a. and lower, 15,000 v. and below without bus, during the year there have been built a number of switchhouses with the bus enclosed in the switchhouse or mounted in an open superstructure above the switchhouse. An installation of the former with the bus enclosed in the switchhouse is at the Milburn Station of the Jersey Central Power & Light Co. This installation consisted of eight switchhouses, two of the houses controlling the incoming line and the other six controlling the outgoing feeders. The feeder housings have the bushings brought out at the side at the right height for connection to feeder regulators. The equipment was shipped in units which were completely assembled and the installation work in the field consisted of connecting the units together with the bus compartment.

During the year much progress has been made in the development of oil filled switchgear for both the indoor and outdoor service. One of the most interesting equipments of this nature was the equipment shipped to the Public Service Co. of Northern Illinois and installed in their Joliet Station. This equipment is for 33-kv. service and consists of seven bays. Six of the bays are arranged for two three-pole oil breakers each and the seventh bay is a metal enclosed inspection bay. The equipment is arranged in a double bus scheme with two breakers per bay, the breakers being rated 1,000,000 kv-a. at 34½ kv. The breakers are of the removable type with disconnecting contacts and are handled by transfer trucks which run beneath the structure. An interesting feature of the equipment is the fact that each bay is shipped almost completely assembled and with the buses filled with oil. The installation work in the field is reduced to a minimum.

During the year, much progress has been made in the development of circuit breakers for the rupture of high voltage high powered a.c. arcs. Outstanding in the development of apparatus of this nature are the De-ion Grids for oil breakers. De-ion Grids consist of laminated structures of insulation and steel plates mounted on the lower end of the breaker bushings. The steel plates are U shaped and contain a narrow groove, open for oil, in which the arc is formed. A magnetic field, caused by the main current of the arc, forces the arc into the closed end of the groove, always in intimate contact with a fresh supply of the entrapped oil. The gas formed in this oil can escape only by rushing through the arc itself, de-ionizing the arc stream preventing the arc from restriking. Breakers when equipped with De-ion Grids have a shorter arcing time, less deterioration of oil and lower pressures built up in their tanks, which results in much better breaker performance and in lowered maintenance on the breaker. Notable among the advantages of the De-ion Grid is the opportunity offered to the power companies to make their systems more stable by clearing troubled lines quickly.

The device has been tested and while it is a relatively new development it can be considered a tried and proven product. In addition to the thorough and exhaustive tests at the Westinghouse Laboratories in East Pittsburgh the De-ion Grid has been given a number of conclusive and thorough tests in the field, among which were tests at 66 kv. on the Duquesne Light Co.'s system, the American Gas and Electric Co.'s system at Stanton, Pa., and the Union Gas and Electric Co.'s system at Cincinnati, O. Tests at 110 kv. were made by the Alabama Power Co. at Bessemer, Ala. Tests at 230 kv. were made by the Philadelphia Electric Co. at Conowingo and at 34.5 kv. by the Wisconsin Gas and Electric Co. at Kenosha, Wis.

The De-ion air breaker was announced early in 1929. At this time a number have been installed and have given very satisfactory service.

In addition to the 500,000-kv-a., 15,000-v. De-ion air breaker, other ratings have been and are being developed. The De-ion principle has been applied to breakers for as low as 600-v. a.c. service, handling short circuit currents in the neighborhood of 10,000 amp. at this voltage.

The 15-kv. Railway De-ion breaker has been improved during the year. This unit will carry 1500 amp. continuously and when operated with high-speed relays, will break 50,000 amp. at 12,000 v. in one cycle—0.04 seconds including the relay time, which qualifies it for extremely severe rupturing service of sectionalizing heavy main contact wires.

The Westinghouse type S induction regulator has met with a very warm welcome. It is characterized by complete enclosure of the operating mechanism, all of which is immersed in oil. This results in trouble-free operation and reduced height and also provides a device which is inherently quieter in operation.

Another valuable feature from the standpoint of installation cost is internal provision for power supply to the operating motor. This eliminates any need for transformers or wirings for regulator control. The instrument transformers are also located within the tank and properly connected. Only the three line connections are necessary to put this regulator in service, thus making it very simple and economical to install.

Another important Westinghouse development is the type RC compensator for line drop compensation in connection with induction regulators. Compensation is accomplished by adjusting two miniature induction regulators within the compensator case. In this manner all contacts have been eliminated and an infinite number of adjustments provided. The type RC compensator is interchangeable mechanically with earlier types but has an unusually low loss and imposes a very small burden on the current transformer.

During 1930 a new autovalve arrester has been developed. In this arrester the principle of operation is changed from that of a glow discharge across minute air gaps formed between carborundum disks to a discharge through minute pores formed in a block of highly porous material. This arrester gives a greater degree of protection against lightning surges not obtainable with any other arresters previously on the market. In addition, this new design permits a greatly reduced size of arrester in most voltages.

Central stations will also be interested in the new Chromilite High Mounting Reflector. Where fixtures must ordinarily be placed on a level with the trusses to prevent interference with operation of cranes the characteristics of Westinghouse Chromilite High Mounting Reflector provides a combined efficiency and durability second to none. Due to its hardness, ordinary cleaning compounds will not destroy it. Due to its high melting point, the heat from a 1500-w. lamp will not produce the slightest discoloration. As it is practically chemically inert, it is not affected by ordinary corrosive influences such as smoke, fumes, soot, moisture, etc. The chromium plated reflecting surface provides specular reflection which is necessary on account of the distance from the light source of the plane to be lighted. The use of spun brass in the body of the reflector and a cast iron holder enclosing the socket gives mechanical strength and durability to the entire unit.

Motor Starters

DEVELOPMENTS made by the Allen-Bradley Co. during the past year include a number of new starters designed to meet specific industrial demand. Bulletin 707 single phase starting switch for motors

operating refrigerating machines, compressors, pumps, oil burners and other motor-driven devices governed by either two-wire or three-wire control is a double-pole magnetic switch with thermal overload relay and has a maximum rating of 1½ hp., 110 v. and 3 hp., 220 v. A unique feature of this starting switch is the operating coil which has a double winding for series-parallel connections permitting the switch to be used interchangeably up to and including 1½ hp. for 110 or 220-v. motors by simply changing the terminal connections of the operating coil. This innovation increases the flexibility of the switch and reduces the number of switches to be carried in stock to meet normal requirements. It

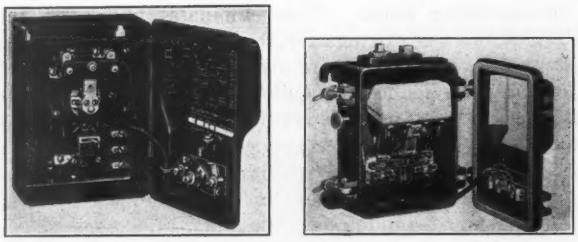


FIG. 1. ALLEN-BRADLEY CO. BULLETIN 707 (LEFT) AND BULLETIN 709WT (RIGHT) STARTING SWITCHES

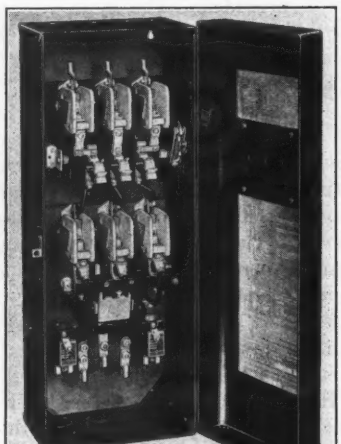


FIG. 2. ALLEN-BRADLEY CO. BULL. 711-712 STARTER

can be furnished with start and stop push buttons in the cover, without push buttons and with two-way lever.

Bulletin 709 W T splash-proof starting switch for a.c. motors is used in laundries, creameries, packing plants and other industries where washdown of equipment is essential or where excessive moisture is present. This switch is also ideal for dusty installations such as in flour mills or cement plants. This switch gives complete overload, no-voltage, and dead-phase protection. It is rated up to 3 hp., 110 v. and 5 hp., 220 v. for single-phase motors and up to 5 hp., 220 v. and 7½ hp., 440-550 v. for polyphase motors. The switch is furnished in three forms: Form 1—with push button in cover, Form 2—for external pilot control and Form 3—with two-way level switch.

This company now furnishes its standard a.c. across-the-line switches equipped with hand-operated disconnect switches and meter test jacks in one cabinet. The disconnect switches are furnished with or without fuse clips. The meter test jacks permit the motor to be tested for load without opening switch cabinet or interfering with machine operation. Bulletin 711-712 switches provide overload, dead-phase, and no-voltage protection. The Type A switch will disrupt a locked motor current. The Type B switch is a motor service switch that disrupts 150 per cent motor full load current. The switches are rated up to 10 hp., 110 v., 30 hp., 220 v. and 60 hp., 440-550 v. and are furnished in three forms: Form 1—with push buttons in the cover, Form 2—for pilot control and Form 3—with 3-way lever switch.

Dust-tight enclosed across-the-line starting switch bulletin No. 721 is made by using the standard Bulletin No. 720 starter mounted on a wall bracket and enclosed by a cabinet made of heavy sheet steel and provided with an electrical interlock making it necessary that the cabinet be properly closed before the starter can be operated. A cover is provided with a thick felt gasket for exclusion of dust and can be instantly removed by unscrewing two wing nuts. This switch is made in sizes up to 100 hp. and voltages as high as 550.

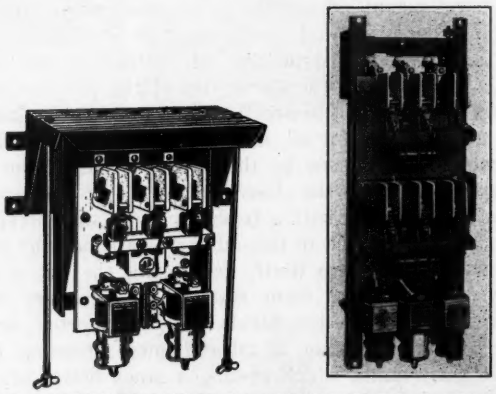


FIG. 3. ALLEN-BRADLEY CO. BULLETIN 721 (LEFT) AND BULLETIN 741 (RIGHT) STARTERS WITHOUT COVERS

The dust-tight enclosed automatic resistance starter Bulletin No. 741 is made by enclosing standard Bulletin No. 740, starter in a cabinet of heavy pressed sheet steel. This cabinet is also provided with an electrical interlock so that the cabinet must be properly closed before the starter can be operated. The removable enclosing cover is provided with thick felt gasket for the exclusion of dust. The cover can be instantly removed by unscrewing two wing nuts. This starter is built for motors up to 75 hp. and voltages as high as 550.

STATEMENT BY CUTLER-HAMMER, INC., MILWAUKEE, WIS.

Cutler-Hammer, Inc. has redesigned its entire line of type AAA automatic starters for small a.c. motors, to incorporate a newly developed Twin Break magnetic contactor. This new contactor provides many features which are of interest. The contacts are of heavy coin-silver which retains its current-carrying capacity even if oxidized and always makes a good contact with little temperature rise. The Twin Break principle reduces the arc voltage by half and Thermoplax arc pockets, by reducing the air content around the contacts, actually prevent the formation of a destructive arc. These arc pockets also act as a shield so that wires which

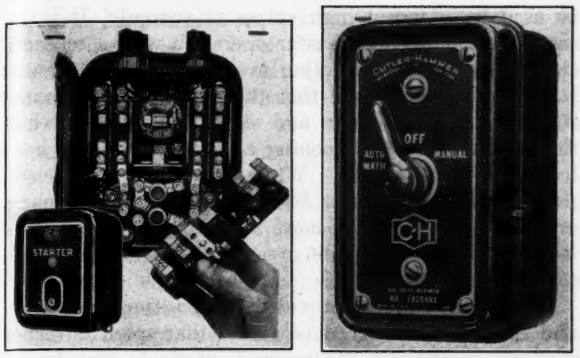


FIG. 4. CUTLER-HAMMER, INC. TYPE AAA AUTOMATIC STARTER WITH CONTACT BOARD REMOVED (LEFT) AND THREE POSITION PILOT SWITCH (RIGHT)

are run along the side of the contactor cannot interfere with its operation.

A magnetic latch has been added to prevent accidental closure of the contacts if the starter is accidentally bumped or tilted—the latch must be drawn aside by the operating magnet before the contacts can close. This is an important feature, especially if the starter is mounted on moving machinery. A new hinge structure facilitates removing and replacing the contact board and insures correct replacing of the board before the starter can operate.

These new contactors are made in three and four-pole types. The maximum rating for two or three phases are: 3 hp., 110 v.; 5 hp., 220 v. and 7½ hp., 440 or 550 v.

Motor-driven pumps, compressors, and similar machines which are controlled by an automatic pilot device such as a float switch, pressure switch or time clock, often require some means of starting and stopping the motor manually. For this purpose a new three-position pilot switch has been developed. The operating lever can be placed in either the "automatic," "off" or "manual" position. When turned to "automatic," the automatic pilot device is in circuit and normal, automatic operation is obtained. With the lever in the "off" position, the pilot circuit is opened and the motor cannot be started from any other control point. Turning the lever to the "manual" position closes the control circuit direct and the motor will run continuously regardless of any other control devices as long as there is operating voltage on the line. The construction is extremely simple. It consists of a two-button pushbutton switch inside the case, the buttons of which are operated by a cam attached to the operating lever. The lever will remain in any one of the three positions.

For convenient starting and stopping of small d.c. and polyphase current motors, this company offers a new bulletin 9103 two-pole, push-button operated starting switch with thermal overload relays. This new starting switch can be used with d.c. motors up to ½ hp., 115 v. and ¼ hp., 230 v. or with a.c. motors, single, two or three phase up to 2 hp., 110 to 550 v. Small in size, the enclosing case is a standard wiring box, the switch can be mounted right on the machine, at the operator's finger tips. For machinery builders, an open type switch for building directly into the machine, is offered. Double-break, silver contacts and a quick break contact mechanism assure long life and continuous current carrying capacity. The thermal overload relays allow working the motor to the limit—yet disconnect it as soon as an overload becomes dangerous to the motor. When tripped by an overload, simply pushing the "reset" button resets the relay and starts the motor. The enclosed switch has conduit knockout holes in the top and bottom for easy wiring. Arrangements are provided for sealing the cover if desired.

A new single pole pressure regulator, exceptionally small in size, designated as Bulletin 10,006, can be used as a starting switch for motors up to one horsepower, 230 v., a.c. or d.c., or as a pilot switch in the control circuit of automatic starters for larger motors. The regulator closes the circuit at low pressure and opens the circuit at high pressure. It can be adjusted to open the circuit at any pressure from 30 to 200 lb. Applications range over a wide field; it can be used for maintaining pressure on systems containing water, air, gas and other similar fluids. For air compressor service, a small unloader device at the side of the case removes back pressure. To withstand moist atmospheres, the enclosing case is black japanned and metal working parts are cadmium plated. Double-break silver contacts prevent pitting and insure good contact. The diaphragm is of rubber. Conduit knockout holes in the case facilitate wiring.

Two new magnetic contactors, for heavy duty a.c. service, are rated for maximum capacities of 300 and 600 amp. respectively. Features of these new contactors make them generally applicable to all heavy duty requirements. They are arranged for either two or three

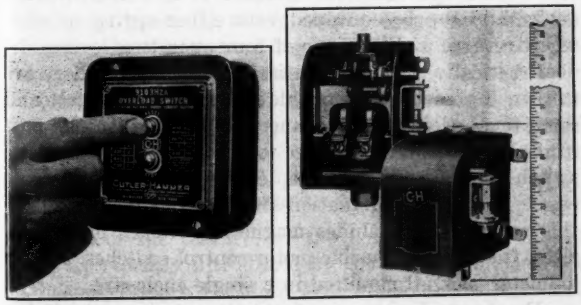


FIG. 5. CUTLER-HAMMER, INC. BULLETIN 9103 STARTING SWITCH (LEFT) AND BULLETIN 10006 MOTOR SWITCHES (RIGHT)

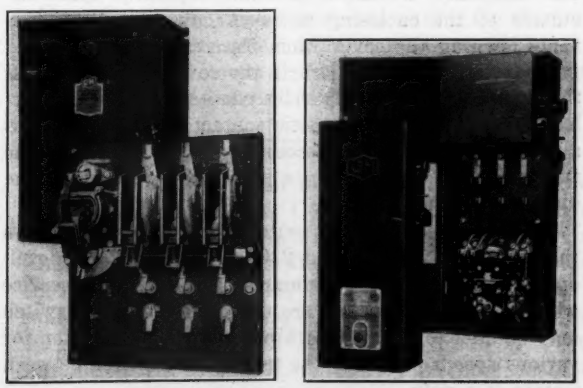


FIG. 6. CUTLER-HAMMER, INC. 300-AMP. HEAVY DUTY CONTACTOR (LEFT) AND STARTER WITH FUSIBLE DISCONNECT SWITCH (RIGHT)

wire control, have continuous duty operating coils, highly efficient magnet structure and exceptionally heavy, butt type, solid copper contacts. An air cushion absorbs the shock of the magnet on closing, thus reducing wear and making the contactor operate more quietly. For general use, the 300-amp. contactor is mounted in a wall type enclosure and the 600-amp. size is in a floor type case.

A new a.c. across-the-line, automatic starter combined with a fusible disconnect switch in a single steel enclosing case may be used in place of the separate starter and fusible disconnect switch requiring less space, simplifying installation and presenting a neater appearance. A feature is a wiring channel between the starter panel and the back of the enclosing case which

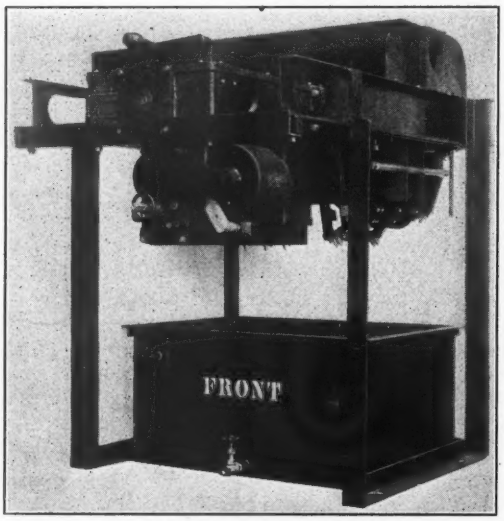


FIG. 7. CUTLER-HAMMER, INC. TWO-SPEED SELECTOR SWITCH DEVELOPED FOR LARGE FAN MOTORS OF FROM 300 TO 500 HP.

allows running the connecting wires behind the panel, where they cannot interfere with the operation of the starter. Ample room is provided to bring all of the connecting wires in at either the top or the bottom of the case according to installation requirements. All parts are mounted on a back plate which is easily removed for pulling and placing of line and motor wiring. The disconnect switch is manually operated from the outside of the enclosing case. A cover interlock prevents opening the cover when the switch is closed and prevents closing the switch if the cover is open, unless the interlock is manually released. An electrical interlock insures that the magnetic contactor of the starter is always open when the disconnect switch is open. The fuse clips are mounted on a slate base, just below the disconnect switch.

A two-speed selector switch for large fan motors that is 300 to 500 hp. and 2300 v. has also been developed by this company primarily for draft fan service where multi-speed motors are used. This transfer switch may be used to reconnect a single multi-speed motor for various speeds or it may be used as a transfer between motors of a pair.

There is no overloading device provided as it was not the intention of the designer that this switch will be used to interrupt high values of current. It is designed to handle the transfer operation with a separate circuit breaker for handling overload or short circuit. It is, however, essential that the transfer switch withstand the thermal effects and mechanical stresses while the circuit breaker is opening and the switch has been tested on short circuit. While the transfer switch is not essentially a circuit breaker, the switch members are capable of breaking more than 2000 amp. of motor load at 2300 v. Alemite grease fittings are provided, except on the motor.

Lamp circuits are provided for position indicating, and spare circuits arranged for so that speed governor contacts, combustion control and interlocks may be arranged to suit the requirements. Manual operation is provided for from a detachable handle and a position indicator is provided to the right of the manually operated shaft. Transferring from automatic to manual operation is done by disengaging a small lock pin and pulling out the manual drive shaft. The mechanism is put back on the ¼-hp. motor drive by pushing this shaft in and it is then locked in place by the same pin. Both pilot and main conduit connections can be made on either side, and conduit connections at the top can be easily provided. The switch is made so that it can be installed in cramped quarters and where head room is limited. Similar switches have been made in the air break form, for 440-v. service, carrying additional contacts for reconnected motors and where secondary or rotor circuits are required.

Statement by The General Electric Co., Schenectady, N. Y.

New magnetic switches suitable for throwing small alternating-current motors directly across the line utilize a three-pole barrier-type magnetically-operated contactor with normally open interlock and two hand-reset temperature overload relays mounted on a moulded base, have been developed by the General Electric Co.

Improvements over previous practice include umbrella-shaped fine silver contacts and a new type of thermal overload relay. The shape of the tips gives the switch a very high interrupting capacity and a minimum amount of wear from continued interruption of current. The thermal relay allows a reasonable time lag before tripping, but permits prompt resetting.

A cam-operated limit switch was developed for industrial control applications. Electrically, it is a two-circuit switch, that by a simple adjustment can be made to operate either normally open or normally closed, or one circuit open and one closed. It is a fast-opening device and can be equipped with either spring or star-wheel return, with any one of four operating levers.

Practically all installations of motors that are thrown across the line include a magnetic switch and some form of fusible disconnecting means. In the past it has been standard practice to use a standard magnetic switch and a safety switch, each enclosed in its own case. A line of combination switches was developed for this service and includes magnetic switches of various sizes, fusible or unfusible motor-control switches, and an ammeter jack all mounted in a single enclosure.

For large direct-current starting equipments, it has in the past been necessary to use circuit breakers as controlling equipment. Owing to the increasing number

of large installations requiring frequent starting, it was found desirable to develop a 2500-amp. contactor designed for this particular type of service. The contactor resembles the smaller direct-current contactors except that it is larger and has improved arc chutes, tips, and includes an overload relay as part of the device.

Heating in the contactor, because of the exceptionally large currents it has to carry, is decreased by using silver tips with a set of auxiliary copper tips for interrupting the current. It can safely interrupt exceptionally large overloads.

A switch for use with multi-speed squirrel-cage induction motors gives different synchronous speeds by changing the polar grouping of the stator coils.

For small motors, the switch serves for a starting switch as well as a pole-changing device and can be used with two, three, or four-speed motors for constant-

FIG. 8. SQUARE D CO. CLASS 2510 MANUAL STARTER

horsepower or constant-torque service without change in mechanical construction.

The unit construction makes possible a wide variety of internal connections as well as the replacement of individual contact assemblies. By removing the tie-rod spacers and compound space washers, the movable contacts are accessible for replacement without dismantling the switch.

Thyratron-tube equipment was successfully applied to the control of small direct-current motors. Briefly, the system involves a pair of Thyratron tubes connected in a full-wave rectifying circuit to supply either armature power or field excitation to the direct-current motor. The output voltage of the Thyratron equipment is controlled by a reactance change which shifts the phase of the grid voltage of the Thyratron tube. This reactance change is generally accomplished by mechanically moving the iron armature in a small solenoid. By this means, it is possible to control the speed of a 5-hp. motor from zero to full speed by armature voltage variation with a controlling energy of three or four inch-ounces.

STATEMENT BY THE SQUARE D CO.,
DETROIT, MICH.

One of the features of the new Class 2510 Manual Starter recently introduced by the Industrial-Controller Division, Square D Co., is that all poles are simultaneously opened with the tripping of either of the two relays. The thermal overload relay used in this new starter is the same reliable type which is being used in the Industrial Controller line of Automatic Starters. Because this relay is incorporated in the design of the new starter, protection is assured for the motor against excessive current, whether due to operating conditions or single phasing of the line. The starter is reset for operation by pressing the button extending through the front cover.

Another feature of this starter is its trip-free handle which prevents blocking of the switch closed against an overload, and as the starter is operated entirely from the front it may be mounted in pairs or groups on pedestal or wall without waste space. The three phase ratings of this starter are 5 hp., 220 v. and 7½ hp., 440-550 v. It is suitable for looms, pumps, portable conveyors, fans and any application where low voltage protection is not required.

STATEMENT BY THE WESTINGHOUSE ELEC. & MFG. CO.,
E. PITTSBURGH, PA.

For constant and adjustable speed direct current motors the Westinghouse Elec. & Mfg. Co. has developed its class 8512 timestarters. This comprises a complete line of remote-controlled magnetic starters for constant and adjustable speed direct current motors in sizes up

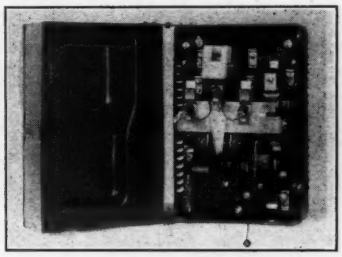
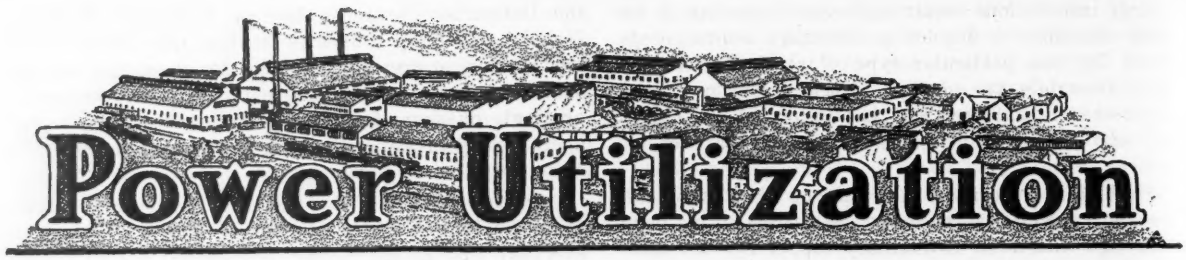


FIG. 9. WESTINGHOUSE ELEC. & MFG. CO. CLASS 8512 TIMESTARTER

to 10 hp., 230 v. They provide three points of definite time limit acceleration, permitting safe and accurate starting of the motor under full or partial load. Four combinations of these starters make them applicable to a wide range of uses in industrial and building applications. Class 8512-A for constant speed motors does not provide overload protection or dynamic braking. Class 8512-B for constant speed motors provides thermal relay overload protection but not dynamic braking. Class 8512-C for constant speed motors provides the overload protection and dynamic braking, and Class 8512-F for adjustable speed motors provides overload protection, dynamic braking and full field starting.

PLANS ARE COMPLETED for the meetings of the Midwest Power Engineering Conference and the National Fuels Meeting of the American Society of Mechanical Engineers in the Stevens Hotel, Chicago, Feb. 10 to 14. Eleven technical sessions, three luncheon meetings, a banquet and ball give ample material for an interesting and profitable week. In addition the Midwest Power Exposition will be held at the Coliseum during the same period so that technical discussion, practical demonstration of progress in plant equipment and social diversion will all be provided.



Crane Maintenance Prevents Delays

REPLACE WORN PARTS; KEEP JOINTS AND ELECTRICAL CONNECTIONS TIGHT; MAKE NEEDED ADJUSTMENTS; ABOVE ALL MAINTAIN PROPER LUBRICATION. BY J. H. GOUGLER*

TO KEEP overhead crane equipment operating 100 per cent efficiently is realized as important by the plant manager of today. Whether the crane plays a part in the production of visible materials or of electrical energy, dependable and continuous crane operation is the main objective.

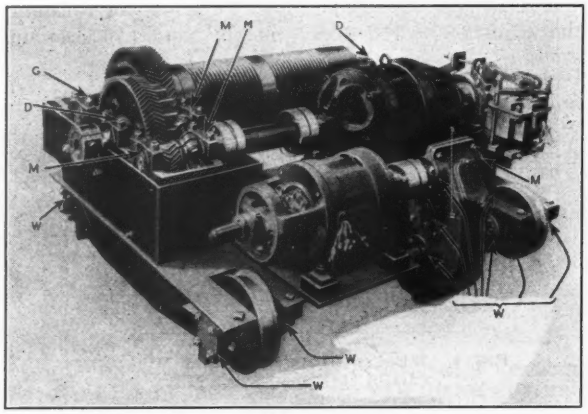


FIG. 1. MODERN CRANE TROLLEY. FOR GEAR CASES G USE MEDIUM HEAVY MACHINE OIL. MOTOR BEARINGS M CLEAN AND FILL WITH SAME OIL EVERY 6 MO. FOR WHEEL AXLE AND DRUM SHAFT BEARINGS W AND D USE SOFT CUP GREASE

Unquestionably it is the business of the manufacturer to build and turn over to a purchaser a high grade, properly adjusted crane but to keep the crane in that condition is surely the duty of the owner. Realizing the many advantages gained by modern crane construction, it must at the same time be kept in mind that the more accurately constructed machine likewise requires specific attention to the maintenance of those parts which mark the crane as a high quality machine.

Maintenance of the present day crane, therefore, calls for a fair idea of the general construction of the crane, knowledge of lubrication, a system of regular inspection and timely repairs.

LUBRICATE REGULARLY

In the maintenance of cranes, proper lubrication, should be placed at the top of the list. Radical changes in the design of cranes have taken place in the past two or three years, consequently lubrication of a crane trolley, such as is illustrated in Fig. 1, equipped with roller-bearing motors and oil tight gear cases, is a study in itself.

Roller bearings should be lubricated to lessen the wear of rollers and cages and also to prevent corrosion. In the semi-oil tight bearings, D and W, a light cup grease is generally recommended, while in the oil tight gear housing, G, where gears and roller bearings are lubricated by the splash system, a medium heavy machine oil is usually found to be most satisfactory. Ball bearings M of motors call for filling with the same oil every 6 mo. after thorough cleaning.

Temperature operating conditions should always be taken into consideration when selecting lubricating materials but for cranes operating under ordinary conditions, the following specifications may be employed: For oils: viscosity, 150—200 Saybolt seconds at 150 deg. F.; flash point, 300—400 deg. F.; cold test, hold original viscosity at 10 deg. F. For grease: a good grade lime base mineral grease.

Located in a convenient place in the operator's cage, a lubrication table, on the order of that with Fig. 1, may be found quite useful as a reference for maintenance men or crane oilers. It should be kept in mind, however, that the frequency of lubrication naturally depends upon the amount of crane service and the temperature where the crane is operating, hence any set rules indicating how often all cranes should be lubricated would be rather impractical.

INSPECTION

In order to assure continuous operation, a complete system of crane inspection with records is the most dependable scheme of preparedness. A form such as indicated may be used for general inspection work. Additional forms for replacement of parts and other details may be worked out advantageously, depending largely upon the scope and severity of the crane service. Among the items that generally required daily examination or adjustment, on a 24-hr. duty crane, in order to prevent serious tie up, are the motors, controllers, solenoid and mechanical brakes, hoisting cable and bridge foot brake.

Study of the policies of operating departments in electric power generating plants pertinent to the carrying of spare parts in stock presents a valuable lesson. Such a procedure, which prepares for that ominous day

*Manager, Service Dept., Whiting Corp., Harvey, Ill.

of the serious breakdown and results in only a minimum loss of time and expense, could be adopted economically by many crane users. A fair representative list of stock breakdown repair parts might include such items, as motor armatures, solenoid brake coils, motor pinions, mechanical brakes, drum shafts, bridge and trolley drive wheels, hoisting rope and idler and block sheaves.

WHITING CORPORATION

HARVEY, ILLINOIS

ELECTRIC CRANE INSPECTION REPORT

Crane No..... Cap'y M. H..... Cap'y A. H.....

Inspector ..... Date ..... 192....

AG—Attention Given **AR**—Attention Required

	OK	AG	AR		OK	AG	AR		OK	AG	AR
Bridge Wheels				Runway				M. H. Rope			
Truck Gears				Runway Conductors				A. H. Rope			
Truck Pinions				Trolley Wheels				Block & Hook M. H.			
Bridge Motor Gear				Trolley Axle Brgs.				Block & Hook A. H.			
Bridge Motor Pinion				Mech. Brake M. H.				Rack Gearing			
Truck Bearings				Mech. Brake A. H.				Rack Motor Pinion			
Sq. Shaft Bearings				Drum Gear M. H.				Rack Bearings			
Foot Brake				Drum Gear A. H.				M. Hoist Drum			
Foot Walk				Mech. Brake Gear M. H				A. Hoist Drum			
Hand Railing				Mech. Brake Gear A. H				Solenoid Brake, M. H.			
Grease Cups				Motor Gear, M. H.				Solenoid Brake, A. H.			
Main Coll. Shoes				Motor Gear, A. H.				Oil in Gear Cases			
Bridge Conductors				M. Hoist Bearings				Trolley Coll. Shoes			
Bolts				Motor Pinion, M. H.				Limit Switch, M. H.			
Switch Board				Motor Pinion, A. H.				Limit Switch, A. H.			

	BEARINGS	BRUSHES	ARMATURE	COMM. RINGS	AIR GAP
Bridge Motor					
M. Hoist Motor					
A. Hoist Motor					
Rack Motor					

	FINGERS	SEGMENTS	CONNECTIONS	RESISTANCE	REMARKS
Bridge Cont'r.					
M. Hoist Cont'r.					
A. Hoist Contr'r.					
Rack Cont'r.					

Has crane been placed in satisfactory operating condition?.....

.....

Remarks. .....

.....

.....

.....

Watch Adjustments

Power economy is, of course, an important factor to keep in mind when reducing operating costs. It will be readily admitted that a smoothly operating machine in first-class condition will consume less power than a machine in a poor state of repair. Consequently it is to the advantage of the crane user to keep his crane in perfect condition. To this end the following points should be watched, which will either directly or indirectly cause an increase in power consumption: Loose electrical connection; worn or burned controller fingers and segments; broken resistance grids; dragging brake wheel shoes; bridge and trolley drive wheels of unequal tread diameter; runway rails out of gage and alinement; loose "girder to truck end" connections.

Prevention of delay in production is the object of all manufacturers and the accomplishment of this purpose depends largely upon having all machines in satisfactory operating condition. To wait until it is absolutely necessary to make repairs and adjustments brings on

complications and trouble multiplies, if the crane is neglected and permitted to operate without making needed adjustments. Timely maintenance, such as tightening all loose bolts, refitting loose keys, testing limit switches, truing up drive wheels and brake wheels, redressing and cleaning of controller contact segments and commutator rings, is a comparatively small expense, when such a policy offsets or prevents a major repair job.

In the majority of plants, the crane is one of the most important machines but, as its location is not readily accessible, it frequently receives less attention than machines of minor importance. Like all other machinery, a crane responds favorably to good maintenance, therefore, it is true economy to preserve a crane by proper care rather than supply repair parts.

Conveyors for Efficient Operation

PARTS FROM VARIOUS POINTS BROUGHT TO ASSEMBLERS. BY K. B. KNAPP

BUICK'S transmission assembly and machining plant ranks high for efficient layout and grouping of machinery as well as for the manner in which its conveyor lines are installed. These conveyors are designed to carry the various sub-assemblies which enter into the makeup of the synchro-mesh transmission direct from point of completion to the final assembly line of factory 40.

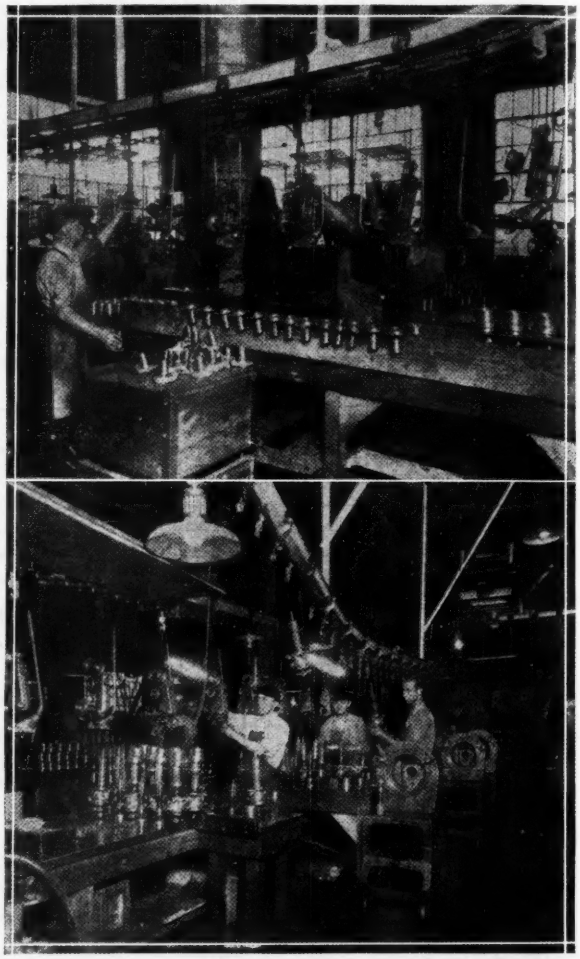
Designed for heavy duty and performing its work well is the transmission case conveyor. This transports the heavy cases from their final machining point on the first floor to the assembly line which it touches at the exact position where assembly workers may detach the cases and place them on the stand conveyor which carries them down the assembly line. This was one of the first conveyors installed in factory 40, having been placed in operation several years ago.

Later, came the necessity for a carrier from the universal joint department. The universal joint ball and end plate assemblies, while comparatively light, must be handled with care in order that they receive no mars or breakage. Formerly they were taken from the first to the second floors on rack type trucks, which necessitated much handling and was at best a troublesome method. Consequently, installation of a conveyor some months ago has given exceptional service. Starting at the point where the joints are assembled to the spline shafts, the conveyor travels to the east side of the building and, after several abrupt bends, rises to the second floor at the starting point of the final assembly line.

From the north end of the second floor a third conveyor travels for two-thirds the length of the plant. As it travels past the various departments, several different portions of the assembly are placed upon its hooks. First is the transmission shift lever, followed by the transmission cover which bears the shifting forks, then the clutch bearing retainer, the thrust bearing and, finally, the synchronizing clutch and ring assembly is attached. Bearing this load on each of its hooks, the conveyor travels back down the plant until it arrives at the final assembly line.

Through these three conveyors, the assembly line is furnished with necessary parts without the great amount of labor necessary under the old regime. Breakage has been almost entirely eliminated while the isles and lanes of the plant are clear of trucks and racks, thus making for safe conditions throughout the shop.

So well was the conveyor installed that a minimum



CHAIN CONVEYORS BRING AUTOMOBILE TRANSMISSION PARTS TO ASSEMBLY POINT, SAVING TRUCKING

of friction is present. Wherever the huge chains contact with bearing surfaces, are placed ball or roller bearings, furnished with an abundance of oil, to carry the load of material easily. Three motors are used. The transmission case chain also the universal joint and transmission cover conveyors is each driven by a 2-hp. motor.

Pipe Line Weight When Full of Liquid

BY CHARLES V. JENKINSON

CALCULATION of support needed for pipe lines is simplified by the accompanying chart, the main chart being for water lines and weights when carrying other liquids being found by use of values of "A" derived from the secondary chart.

For pipes carrying water, the main chart is used as follows: Run a line from the diameter of pipe scale at the left to the Weight per Foot of Metal at the right. From the inclined Length of Pipe scale, run a line parallel to the first one and its intersection with the

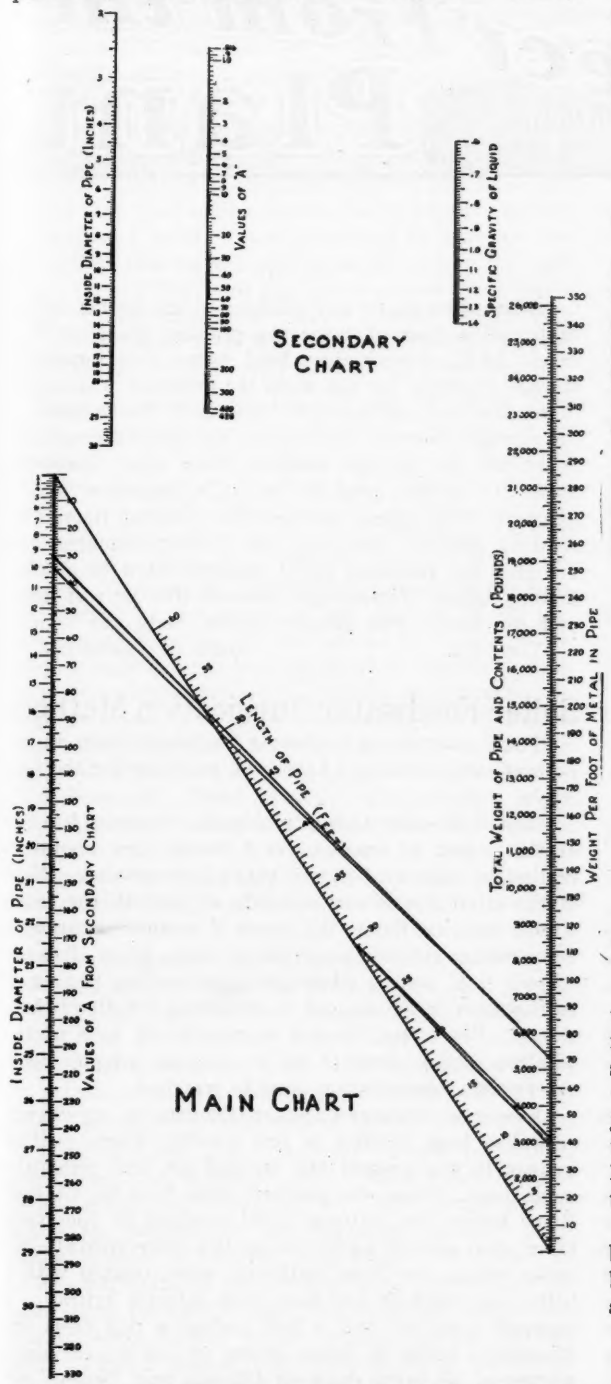

Inside Diameter of Pipe (Inches)
Values of "A"
Specific Gravity of Liquid
Secondary Chart
Length of Pipe (Feet)
Total Weight of Pipe and Contents (Pounds)
Weight per Foot of Metal in Pipe
Inside Diameter of Pipe (Inches)
Values of A from Secondary Chart
Main Chart

CHART FOR WEIGHT OF PIPE LINES RUNNING FULL OF LIQUID

right-hand scale, Total Weight of Pipe and Contents will give the weight of the filled line of pipe.

In case of a liquid other than water, on the secondary chart, from the right-hand specific gravity scale run a line to the left-hand Diameter of Pipe scale and note the value of A on the center scale. This value is then used on the main chart left-hand scale instead of the inside diameter of pipe in establishing the first line on the main chart.

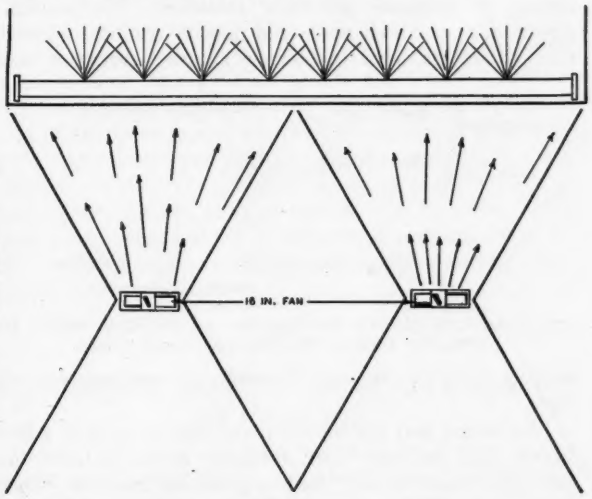
Examples are shown for a 10-in. pipe, 30 ft. long, weighing 70 lb. per ft., first when filled with water, the total weight being 3150 lb.; second when carrying a liquid whose specific gravity is 0.9, the total weight being 2950 lb.

Air Circulation in Meat Cooler

MOLDY SAUSAGES were reported in the cooling room and it was my job to find the reason.

Inspection showed an open-spray, shallow brine bunker, the full length of the room but only one-quarter the width. Depth of the bunker was 32 in., the jets spraying straight down from the top. Air circulation on the cold air side of the bunker was so weak that a piece of tissue paper showed no movement.

In ordinary routine many thousands of pounds of cooked sausage were put, each night, into the cooler,



FAN CIRCULATION SAVED THE SAUSAGES

which already contained several thousand pounds, already cooled. As a result, moisture from the warm sausage condensed on the cold, causing mold.

To overcome the poor circulation, we built two Vs just below the bunker, moved the spray to the floor of the bunker and pointed the sprays upward, then set two 16-in. fans as shown in the sketch to force air up through the bunker.

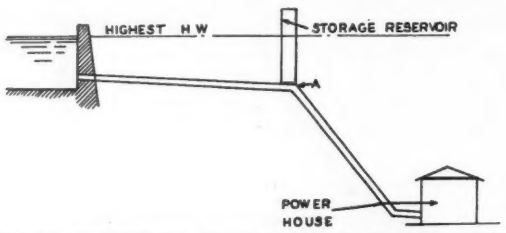
Rapid air circulation brought the moisture to the bunker, where it was condensed and taken up in the brine, so that mold was stopped and the loss eliminated, all at a small cost.

Kansas City, Kansas. J. F. STALEY.

REPAIR JOBS that can be accomplished by a welding outfit in the plant are limited only by the ingenuity of the welder. Such jobs as motor end bells, motor feet, valve stems, shafts, sprockets, gears, brackets, pump casings, impellers, and holes or cracking in machinery and piping are typical of what can be done in the power plant.

Correcting a Troublesome Pipeline Condition

AFTER RUNNING for several years with a practically constant load during the day, a certain hydroelectric plant was rebuilt and, among other changes, a quick-acting oil pressure governor installed. No pipeline profile ever had been made and nobody troubled himself much about it since the owner assured everyone that



STORAGE RESERVOIR INSTALLED AT SUDDEN DROP IN PIPELINE PREVENTS BREAKING OF FLOW

having installed the job himself, everything was all right.

No sooner had the rebuilt plant started up and a few heavy load changes been indulged in to see how the new governor worked, than regulation troubles galore developed. The pressure increase on load rejections was about 70 per cent of the normal head and when the governor opened the gates to take on load the pressure drop was still higher in percentage. The closing and opening time was then adjusted to reduce the heavy pressure variations and when they had been brought down to a reasonable figure, it was found that the speed changes were too great on account of insufficient flywheel effect.

Addition of a heavy flywheel, for which the owner would not pay and which the shafting and bearings could not support or the development of a hydraulic means of improving the pipeline condition therefore were necessary. A survey was made quickly and a profile plotted and studied. There were some rather large bends in the horizontal plane and one bend of over 45 deg. in the vertical plane, the profile being as shown in the sketch. A little reasoning soon showed that the trouble was at the knee bend marked "A," for it will be seen at once that when there is a heavy draft of water due to a substantial load increase, the moving water column tends to part at the knee due to the great difference in the acceleration forces above and below the knee.

After some study and conference, the owner agreed to install a riser of twice the pipeline diameter to a height 10 ft. above highest head water, thus forming a storage reservoir for use when the governor was acting. When the load was suddenly increased, the contents of the storage reservoir were drawn upon and during load rejections the storage reservoir was filled somewhat above its normal level to act as a retardant and a damper. This change enabled the governor time to be reduced greatly, smoothing out pressure changes and bringing the resulting speed changes down to a satisfactory figure. The storage reservoir did not cost much and the owner was greatly pleased with the results.

York, Pa. JOHN S. CARPENTER.

Boiler Feedwater Purification Methods

YOUR ARTICLES on feedwater treatment cover an important subject which I have been studying for the past 30 yr.

Magnesium chloride is a troublesome impurity but one of the easiest to remove, yet I believe few engineers realize the important part it plays in feedwaters. Most of the attributes of common salt, at least all the undesirable ones, are due to the traces of magnesium present. Pure sodium chloride is neutral to litmus paper, does not corrode iron, steel or silver nor cause scaling, pitting or incrustation in boilers, yet it is blamed for all of these things. Sea water, treated to remove all salts of the alkaline earths, presents no troubles as a boiler feed, except that concentration must be watched.

I reserve comment on embrittlement, as my experience has been limited to one locality where sodium hydroxide was present and we did not find embrittlement there. Those who pumped water from the Chicago River before the drainage canal was put in operation, know what organic matter is, yet this river yielded clear boiler water, free from sediment, when treated with a little iron sulphate and then with calcium hydrate. I pumped a million and a half gallons a day from the Mississippi below St. Louis, where we had the combined sewage of all towns between Chicago and Denver, yet after this treatment, our water was biologically almost pure, the iron sulphate and calcium hydrate killing 99 per cent of microbes present. We had to have water absolutely free from iron and organic matter for our work; other impurities did not matter, yet for the boilers, we wanted no excess of lime or incrusting salts. To maintain the chemical balance with semi-skilled labor,

we placed a beaker with a weak solution of phenolphthalein in front of a window, and allowed a drop of water to fall into it every five minutes. Later we substituted a glass funnel, allowing a drop of water and a drop of phenol to fall at stated intervals; as long as the combined drops were light pink in color, we knew all was well. Our boiler feed was made up of about half condensed and half makeup water, an open heater removed all gases and cleanings were seldom made though a daily observation of the blowoff water was maintained.

Treating at boiling point or even when lukewarm, reduces the amount of chemicals required and facilitates settling if an open sedimentation tank is used but at best, this method is inferior to filtering and as there are several hollow tiles on the market at low prices that will fit any type of filter and pass water as readily as cotton cloth, yet hold back all sediment, I prefer the filtering system. We used the type of softener described on page 614 of the June 1 issue and have found none better.

From the chemical reactions on page 615 of the June 1 issue, we can see that the printer and proofreader are not chemists, so can excuse them but one error should be corrected. Sodium carbonate is not broken into sodium hydrate and carbon dioxide at any ordinary temperature. The dissociation point is above 3100 deg. F. and it and its mate, potassium carbonate, can be distilled unchanged. Calcium and magnesium phosphates are soluble in water to the extent of one part in 25,000 and 5000 respectively, but are decomposed by boiling water, which is another argument in favor of treating and filtering the water when cold. Sodium silicate acts precisely as a zeolite as is to be expected and it can be regenerated from the sludge in the same way but it is hardly worth the while. In the presence of iron sulphate which is usually found in mine water, it gives better results than zeolite as preliminary treatment with lime is necessary in the zeolite process. In fact with extremely hard waters, I think this is advisable as it saves much reconditioning and lime is as cheap, if not cheaper, than salt.

There is another type of zeolite which is different from those described that has had a limited use. I refer to the green sands of New Jersey. Here, instead of sodium, the softening agent is potassium silicate but after reconditioning, this becomes the same as the others, the potassium silicate changing to sodium silicate. A large building in St. Louis used one charge for five years.

Along the Salt and Gila River valleys in Arizona, embrittlement is frequently met. Both rivers carry a little of everything in solution but I have always blamed magnesium chloride, for the following reasons: Magnesium chloride is a loosely bound salt. If exposed to the air, everything of steel or iron in its vicinity becomes rusted from the hydrochloric acid given off, magnesium hydrate being formed as an incrustation on the salt itself. Thus it attacks iron, zinc, silver or any other metal easily attacked by hydrochloric acid. Used in brine tanks, in time it destroys both plain and galvanized iron and I believe that ice manufacturers specify against more than a trace in the calcium chloride used. Many so-called cases of electrolysis are simply corrosion from this source. True, there is a feeble electrical action there but this is generated by the decomposition of the magnesium chloride in contact with two metals.

My own experience with water containing caustic soda, sodium hydroxide, was on the San Simon desert. The blowoff water there was strong enough to take the skin off the hands, yet beyond priming it gave no trouble, the boiler using it having no scale nor pitting after 6-yr. use. By that time the tubes were almost gone, although they were not brittle. Sodium carbonate and sulphate were also present.

Further, regarding water purification, calcium hydrate, added to water carrying iron in solution either as sulphate or chloride, precipitates ferrous hydrate which oxydizes to ferric hydrate, which, if undisturbed, settles to the bottom carrying with it all suspended and most of the albuminous matter.

About 35 yr. ago, a process was brought out, using iron filings in a tumbling barrel for the same purpose, the theory on which its action was based being that the finely divided iron was dissolved or converted to hydrate in the presence of organic matter, the great difficulty being in getting the iron in a finely divided state at low cost. This process, so far as the writer knows, never passed beyond the experimental stage.

Now, if the ferrous-ferric hydrate is agitated, the filtered water may show traces of bacteria but if sufficient settling time be allowed and the water decanted, the water is found to be pure. It seems that the oxidation of the ferrous hydrate is at the expense of the bacteria, thus destroying them by depriving them of their oxygen. If the water is agitated, much of the oxygen is taken from the air, thus preserving the bacteria. This theory has been verified by microscopic examination of the action of calcium and ferrous hydrate on the algae in the Mississippi.

Cleveland, Ohio. L. R. BAKER.

Revamping Boilers Increases Capacity 60 Per Cent

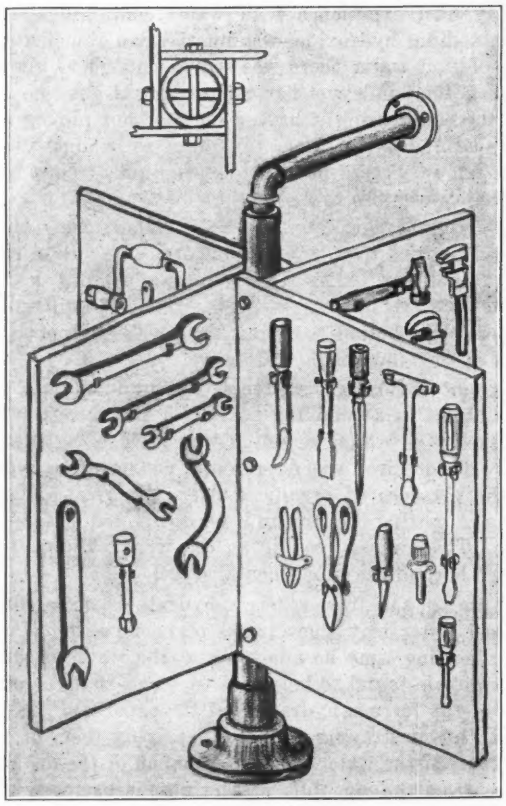
OUR ATTENTION has been called to an article in the November 15 issue, under the above title, in which the following statement appears in the second column of page 1274: "Attention should be paid to the absence of water circulators in Fig. 3. At the recommendation of the boiler company, these were removed when the furnace was built."

In the installation as originally made, every other tube in the front row of the last bank of boiler tubes was connected to the middle steam drum. It will be noted on Fig. 1 that there are two rows of water circulators connecting the middle steam and water drum to the front drum. The only change recommended in the water circulating system, to take care of the increased capacity, was the removal of the upper row of water circulators between the middle and front steam drums and the installation of ferrules in the existing lower row.

New York, N. Y. THE BABCOCK & WILCOX CO.

Revolving Tool Board Aids Tool Maintenance

RECENTLY I USED a little of the spare time at the plant, when things were running along smoothly, to make the handy revolving tool board shown in the ac-



FOUR BOARDS FASTENED TOGETHER THROUGH AN OLD BOILER TUBE MAKES CONVENIENT ADDITION TO ENGINE ROOM

companying sketch from materials that were at hand in the shop.

It certainly does make a neat and useful addition to the workbench. Now, the many necessary scrapers, wrenches and small hand tools can be quickly picked out at a glance. No dull or shabby tools are found now for they would be in plain sight; therefore they reflect the pride of the engine-room force.

Good hard wood boards, well joined and secured, as shown at A, to a piece of boiler tubing or pipe, set on a flange and secured at the top to the wall by means of a short length of pipe and a flange, provide necessary rigidity.

Concord, N. H. CHAS. H. WILLEY.

Rebuilding a Cross Belt Drive

IN A SMALL variety wood working shop, a double-crossed belt drive caused trouble. Power for the shop was obtained from a neighboring concern through shaft 1, Fig. 1 and shafts 2 and 3 were in the variety shop and in order to suit the machines as installed, shaft 2 was required to be driven counter-clockwise, while shaft 3 ran in a clockwise direction.

The owner of the shop complained to an engineer friend that the crossed belts, which were originally 8 in. wide, wore out quickly and required constant repairing and frequent renewal. Finally the engineer visited the plant with a view to recommending a means for prolonging the life of the two expensive belts.

Upon looking over the troublesome belt drive, the engineer found a 24-in. pulley with a 12-in. face, while shaft 2 carried two similar pulleys side by side and shaft 3 was fitted with another pulley, D, of similar dimensions. After inspecting the arrangement, the engineer made a sketch, Fig. 2, and told the owner to remove one of the two pulleys from the middle shaft and to mount this pulley on a short shaft as shown at F, Fig. 2. Pulley F was to be placed in alinement with pulley E on shaft 1 and with pulley G on shaft 2. Pulleys E and G were to remain in their original positions and pulley H, which corresponds to pulley D, Fig. 1, was to be moved along on shaft 3 until it was in alinement with the other pulleys E, F and G. Both the crossed belts shown by

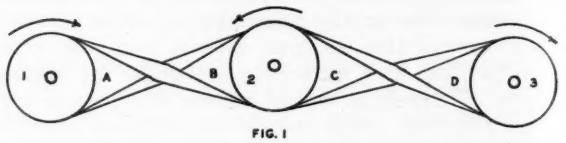


FIG. 1

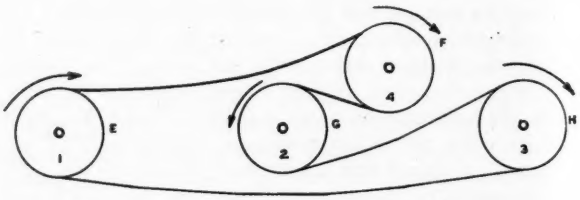


FIG. 2

CROSSED BELTS AVOIDED BY PULLEY ADJUSTMENT

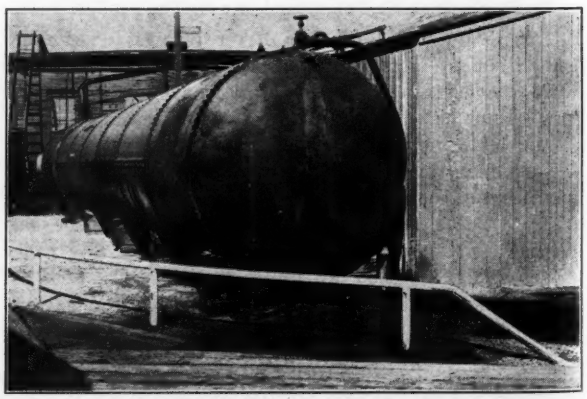
Fig. 1 were then taken apart and laced together into one long piece. This arrangement of the long belt drive made the lower length from H to E, the working length, the slack length then being on the top where it belongs.

Indianapolis, Ind. JAMES F. HOBART.

Old Flues Make Neat Guard Railing

A PIECE of neat, serviceable and very inexpensive guard railing for the plant walks and driveways is shown above. Four-foot pieces of old flue are driven into the ground and longer pieces welded along the tops with the torch. When kept painted white, they make a decorative and durable railing for this purpose.

Missouri Valley, Iowa. FRANK BENTLEY.



OLD BOILER FLUES WELDED TOGETHER AND TO UPRIGHTS AND PAINTED WHITE MAKE ATTRACTIVE RAILING

Alcohol and Acetylene as Engine Fuels

Is there any information available on alcohol as fuel for internal combustion engines? Has it been used with any success? How about automobile engines? What is the heating value in B.t.u. per pound and how does this compare with the heating value of gasoline?

2. Has acetylene or calcium carbide ever been used in engines? If so, is there any information available similar to that asked in the first question? F. V. G.

A. Alcohol has been used as fuel in internal combustion engines including automobile engines in Europe for years, especially in countries where crude oil is scarce. It is not used in this country for that purpose because of the comparatively low price of gasoline and fuel oil. If alcohol could be produced at a greatly reduced cost, it would compete more effectively with the other fuels named.

In the Scandinavian countries, alcohol is produced for power purposes from waste sulphite from the paper mills and in other European countries corn stalks and other farm wastes are used for this purpose.

A gasoline engine having the usual compression pressure of 70 lb. but otherwise as well suited to the economical use of denatured alcohol as it is to gasoline, will, when using this alcohol, deliver about 10 per cent greater maximum power than when using gasoline. When the fuels for which they are designed are used to an equal advantage, the maximum power of an alcohol engine having a compression pressure of 180 lb. is about 30 per cent greater than that of a gasoline engine of the same size and speed having a compression pressure of 70 lb.

In order to use ethyl or grain alcohol as a fuel, some countries, notably the United States and France, require by law that it shall be denatured by admixture with wood alcohol, pyridine bases or other denaturants in prescribed quantities. Commercial alcohol always contains water.

Specific Gravity and Heating Value of Various Mixtures of Alcohol and Water

Per cent of alcohol in mixture by volume	Per cent of alcohol in mixture by weight	Specific gravity	Lower heating value per lb., B.t.u.
95	93.8	0.805	10,880
90	87.8	0.815	10,080
85	81.8	0.826	9,360
80	76.1	0.836	8,630
75	70.5	0.846	7,920
70	65.0	0.856	7,200

Approximate lower heats of combustion for American commercial alcohol in B.t.u. per pound are as follows: Wood alcohol, 8140; 95 per cent ethyl alcohol 10,500, the higher value being 11,900 and denatured alcohol, 10,350. Ethyl alcohol requires 9.04 lb. of air per pound of alcohol for combustion while denatured alcohol requires 7.83 lb. per pound. A 50 per cent mixture of alcohol and benzol requires 10.6 lb. of air per pound of mixture and has a lower heating value of 13,300 B.t.u. per lb. and a higher heating value of 14,200 B.t.u.

Following standard practice, the higher heating value is taken, in every case, as that which is obtained by use of a calorimeter while the so-called lower heating value is that which is actually available for power purposes because of water contained in the fuel.

One pound of gasoline vapor at 62 deg. F. and atmosphere pressure has a volume of 4.2 cu. ft. With 15 per cent excess air, 1 cu. ft. of vapor requires 54.2 cu. ft. of air and assuming 18,500 B.t.u. as the lower heating value per pound, the heating value per cubic foot of normal charge is 69.3 B.t.u.

2. Acetylene, as a fuel, has commercial use at present only in oxy-acetylene torches for cutting and welding metals in which the combustion of a mixture of 1 volume of acetylene and 1.7 volumes of oxygen or 8.5 volumes of air produce a reducing flame at a temperature of 6300 deg. F.

Acetylene gas is produced by mixing calcium carbide with water. Sixty-four pounds of calcium carbide combined with 36 lb. of water will produce 26 lb. of acetylene and 74 lb. of pure slaked lime.

Acetylene produces 1475 B.t.u. per cu. ft. at 70 deg. F. and 30 in. of mercury as compared with 1000 B.t.u. for natural gas and 500 to 550 B.t.u. for coal or water gas. The explosive limits of acetylene and air are from 3 per cent of acetylene and 97 per cent of air to 24 per cent acetylene and 76 per cent of air, the point of maximum explosibility being 7.7 per cent of acetylene and 92.3 per cent of air.

Compressor Valve Caking

What may cause the valves of the air compressor on a Diesel engine to cake with carbon? The compressor valves attached to our engine cake badly when the engine runs under light load for any considerable length of time. K. A. P.

A. From your question we take it that the caking action does not occur under full load operation. It is due, therefore, to the high-temperature conditions occurring at light loads. Temperature of discharge is high on light loads because the suction air is throttled under that condition, thus lowering the suction pressure.

As the temperatures vary with the pressure ratio and as it is possible for the temperature of the last stage to be above the vaporizing point of the lubricating oil during light load operation, caking may occur, since the light portions of the oil will be vaporized, leaving a gummy residue which settles on the valves.

To remedy this condition, it would be well to try a high-test oil or run the engine with the suction line open and let the excess air escape through a relief valve.

Editorial Comment

Take Inventory of Your Information

Following the close of its fiscal year, every modern business house takes inventory of its physical possessions by means of which a comparison can be made with former possessions and values to determine among other things, the financial strength of the concern, the amount of gain or loss during the year, the stock that sells rapidly or slowly, what and how much to buy, what stock to close out perhaps at a loss. Such an inventory is purely physical but back of it all is the human efficiency of the organization which is extremely hard to measure and difficult to evaluate. Poor management of a labor situation may result in great loss to a concern, as may also mistreatment of a valuable customer. Good will may fluctuate considerably from year to year without showing in the inventory, it will, however, show up in the profits.

Your power plant may not have one more piece of equipment in it now than it had last year at this time yet because of a better understanding of its operation on the part of the man power, it may represent considerably more value than it did. To determine this, it is only necessary to compare the earning power of the plant over different periods of time.

To the engineer, this inventory of ability, if we may be permitted to call it such, is of extreme importance. It may denote progress or it may show retrogression. This past year is recognized as one in which financial progress took a vacation but that does not necessarily mean that all progress ceased and it would be well for the engineer to take stock of the things he has learned and the plans he has made for improving the earning power of his plant.

In times of overload, too frequently we resort to expediency in meeting difficult situations with the hope that some day the temporary arrangement will give way to a permanent, carefully calculated solution. During these slack times, the opportunity has been given to many organizations to plan improvements, to study changing load conditions, to improve personnel organization, to look into the changing processes in the factory and how best to render service from the power plant. All engineering work starts with the conception of future needs and progresses through the planning and blueprint stage before it is ready for submission to the financial management for approval to proceed with the actual physical work. Up to this point the expense is relatively small but it takes time and the management has little patience to wait for equipment to be installed when business is rushing. The engineer with well considered plans in his desk is as good as a substantial bank balance to the firm that will need additional equipment for a season of increased output.

Manufacturers have made many improvements in their products. These should be known by the engineer. Many industrial plants have improved their heat balance by slight changes in processes and the program of power loading. This is another subject for study by engineers. The invisible inventory of the engineering organization is sure to be called upon when plant services are needed and the stock of information should be plentiful and up to date.

Evolution vs. Revolution

As one reviews the equipment described in this issue it is impossible to escape the perfection of detail reflected in practically every piece. Although we all look for the sensational, the unusual, that upon which our imagination can run riot, we know that underneath the surface the entire structure of the power plant industry is supported by and held together with details.

How often do we stop to realize the important parts being played by such pieces of equipment as motor starters and valves? How often do we think of the waste of antiquated power transmission equipment? How often do we think of improper lighting and heating as impairing the efficiency of plant employees? Yet it is these simple things that determine to a large extent the overall efficiency of the plant. It is simply an illustration of the saying, "If you watch the pennies, the dollars take care of themselves."

To say that a piece of equipment has served its purpose for 20 years is the best argument possible for retiring it. While this unit has been about its duties the world has progressed 20 years and it is a foregone conclusion that the operating cost of such an old machine is each year eating up a large part of the cost of a modern unit. Many 1910 automobiles are still as serviceable as the day they were built, still as superior to the horse and wagon they replaced but so far behind the modern automobile in power, speed, flexibility and fuel consumption that it would be economically impossible to operate one.

Equipment presented in this issue is the acme of detail design, the pennies of the power and industrial plant. As you read each item stop and think where each item would fit in your plant. Estimate roughly the power it would save, the labor and material it would save, the increase in reliability, the better supervision and higher morale of the operating force. At the end total them up mentally and see what an improvement a few such items mean in the operation of your plant.

Few revolutionary developments have taken place in our field, perhaps pulverized coal is the best example and, although it gained practically instant recognition as a factor in our industry, we must not forget the years of evolution in other industries before it was transplanted bodily in the power plant. For all but a few venturesome individuals the industry progresses by evolution, the constant refinement of detail as exemplified in this issue. The equipment reviewed is the result of years of design experience by dozens of manufacturers; the culmination of years of constant betterment and service tests, arranged for your convenience.

Refrigeration by Water and Mercury

Water forms the refrigerant and a gas-fired mercury boiler is the source of energy in a new type of refrigerator, now ready for the first stages of commercialization, according to the Industrial Bulletin. In operation, mercury is boiled and the resulting mercury vapor at a temperature of somewhat over 700 deg. F. passes through an aspirator, drawing water vapor from the brine in a cooler with it. At precisely the right point in the system, the mercury vapor is then cooled and liquefied. At this point, entrainment of water vapor and condensation of the mercury in the condenser produce a vacuum, causing water to evaporate rapidly. In thus evaporating, the water absorbs heat; in other words, cooling effect—refrigeration—is produced.

Nowhere in this system, it is stated, does the pressure exceed atmospheric and there are no glands, packing nor stuffing boxes. Operation is continuous; this, it is stated, permits the temperature of the cooler to vary only 2 or 3 deg.

While this refrigerator is not yet on the market, strong interests are reported to be backing it. Its interest for engineers lies in the use of mercury and the advantage taken of the fact that water takes up more heat per pound in being vaporized than any of the other liquids now used as refrigerants. Interest in various absorption and adsorption systems (the latter typified by the silica gel system) is growing rapidly. They may lead to important developments in refrigeration for industry. Where exhaust steam is available, the ammonia absorption system, in its modern forms, has had many interesting applications.

All such systems, however, to justify themselves for industrial use, must compete on the dollar basis, as well as the engineering basis. The system described above may be able to do so successfully. Other liquids, such as those proposed for other binary-vapor steam cycles, may also find application in refrigeration. The above example of the use of mercury and water for making cold is original and thought-provoking. It is typical of the high type of engineering thought that is being applied to the problems of refrigeration.

Off Duty

As the earth returns astronomically speaking, to another January first and starts anew on its 600 million mile swing around the sun, it finds the so-called human race which clings to its surface in a perturbed state. All, it seems, is not well on the planet and though its period of revolution is still 24 hr. and the temperature range on its surface is still such as to permit these human creatures to live, love and hate without discomfort, they are not wholly at ease.

Only a trifle over a year ago, all was rosy, at least for those who called themselves Americans. Sitting on top of the world, they had plenty of everything including prohibition. And then it all tumbled.

But are things really as bad as they appear to be? Perhaps we are over-estimating the importance of little things. As pointed out, the period of the earth's rotation has not changed materially despite the market crash, and our distance from the sun is about the same as it was before the Black Thursday of '29. Furthermore, from what astronomy has to tell us, for some time to come we can be assured of an abundance of warmth and sunshine and as long as we have that we need not starve. And if we can't settle all our petty problems in a day, what of it? There is still lots of time.

In Sir James Jeans fascinating book, "The Universe Around Us," he explains in a novel way what the million years or more that the human race has to look forward to, really mean.

Take a postage stamp and stick it on a penny. Now, climb Cleopatra's needle (this is not easy but manage it somehow) and lay the penny flat, stamp uppermost, on top of the obelisk. Having accomplished this, the whole structure may be taken to represent the time that has elapsed since the earth was born. On this scale, the thickness of the penny and the postage stamp together represents the time man has lived on earth. The thickness of the stamp represents the time that he has been civilized.

Now stick another stamp on top of the first to represent the next 5000 yr. of civilization and keep sticking on stamps until you have a pile as high as Mt. Blanc. Better use one cent stamps in doing this. Even now the pile forms an inadequate representation of the length of the future which, as far as astronomy can see, stretches before civilized humanity. The first postage stamp was the past civilization; the column higher than Mt. Blanc is its future.

As inhabitants of the earth, we are living at the very beginning of time. We have come into being in the fresh glory of the dawn and a day of almost unthinkable length stretches before us with unimaginable opportunities for accomplishment. Our descendants of far-off ages looking down this long vista of time, will see our age as the misty morning of the world's history, our contemporaries of today will appear as dim heroic figures who fought their way through jungles of ignorance, error and superstition to discover truth and to learn how to harness the forces of nature and to make the world worthy for mankind to live in.

So, as we start on our 1931 journey around the sun, perhaps things are not so bad as they appear from our limited terrestrial viewpoints. We have plenty of time ahead of us, and nature seems to be on our side. If our industrial and political machinery has not proved as reliable as we thought it was, we can learn what the cause of the failure was and so repair and strengthen it. If our stock market proved a house of cards, perhaps our next one will have more stability. We must learn somehow and experience is not a bad teacher.

In the 300,000 yr. that man has existed on earth, he has accomplished marvels, yet compared to what he has to live for in the future all this probably is as nothing. In the words of Jeans again, "we are still too much engulfed in the greyness of the morning mists to be able to imagine, even vaguely, how this world will appear to those who will come after us and see in the full light of day but, by what light we have, we seem to decern that the message of astronomy is one of hope to the race."

So don't be discouraged. If business is bad now, in the year 103,504 the market may be up. Anyway, we wish everybody a happy and prosperous year.

Yearly Index

INDEX for Volume XXXIV of Power Plant Engineering is now prepared and will be sent free to subscribers upon request.

Utilities Progress in 1931

By John J. O'Brien*

PREDICATED on the belief that general industrial, agricultural and commercial conditions will improve materially during the year, utilities should go forward substantially in the quantity of service rendered to the public and in increased gross and net earnings in 1931.

Continuing, Mr. O'Brien said: Not only are the utilities as a whole financially and physically sound but their systems are built up to a point where a large amount of additional business may be taken on with relatively small additional capital investment. The great majority have placed in effect lower and modern promotional rate schedules within the past few years, hence their services are cheaper than ever before. Supplies and materials entering into operating expenses are lower in price than for a long period and operating efficiencies are probably the highest in the history of the industry. The public's appreciative knowledge of electric and gas household appliances has become much more widely diffused; in fact it may be said that our services in their multiplied applications have reached a high degree of public acceptance.

Many utility companies increased their business and earnings during 1930. Where a falling off in output occurred, it was due to lessened power and heating demands from industries already served. Residential and commercial sales gained in a most satisfactory manner and large amounts of new industrial business were contracted for. Added commercial and residential sales served to offset the loss from already connected industrial customers. During 1931 our power and heating business should advance in conformity with the expected industrial revival. Even in a depressed year such as 1930, it is noticeable that substantial gains were made in the number of new residential customers, thus reflecting population growth and public insistence upon modern facilities.

Current political attacks upon the utilities of a national and state character are strangely at variance with local or municipal conditions. As opposed to intemperate charges from political sources, we find the people disposed to settle long-standing disputes by voting new franchises such as those adjusting the street railway problems in Chicago and San Francisco, and the renewing of light and power franchises by large popular majorities, as in Oklahoma City. In general, it may be said that when politicians keep their hands off, the utility companies and the people have no difficulty in solving their problems and working together for mutual benefit.

Over-regulation of the utilities would be disastrous to local, state and natural development and greatly weaken the part that these institutions should play in the maintenance of general prosperity. The utilities are already regulated as strictly as the protection of the public requires, yet at the same time permit them to be of maximum public benefit. I believe that recognition of these facts will prevent unduly repressive legislation, and that the present national policy of encouraging the utilities to grow progressively will be continued.

*President, Standard Gas and Electric Co.

Pittsburgh Prepares Program for A. S. H. and V. E.

Under the leadership of H. Lee Moore, general chairman of the Arrangements Committee for the Pittsburgh Chapter, plans have progressed rapidly for the 37th Annual Meeting of the American Society of Heating and Ventilating Engineers to be held at the William Penn Hotel, January 26 to 29, 1931.

The meeting will be called to order by Pres. L. A. Harding, at 2:00 p. m. Monday, January 26, at the William Penn Hotel, and on each day thereafter technical sessions will be held. On Wednesday all scheduled events will be transferred to the A.S.H.V.E. Research Laboratory at the U. S. Bureau of Mines Experiment Station, where a technical program will be given in the morning and the afternoon will be devoted to inspection.

In addition to an attractive program of technical papers, consideration will be given to several Codes which have been developed during the past year; two which have already been reported to the council are the Code on Oil Burning Devices and the Code for Testing and Rating Concealed Gravity Type Radiation.

Papers offered for the meeting include: Insulating Effect of Successive Air Spaces Bounded by Bright Metallic Surfaces, by L. W. Schad; Special Distribution of the Energy Radiated from Metallic Surfaces at High Temperature, by G. R. Greenslade; Wind Velocities and Temperature Gradient Near Surfaces, by Houghton and McDermott; A Quarter Century of Development in Heating and Ventilating during 1930, by S. R. Lewis; Some Studies on the Absorption of Noise in Ventilating Ducts, by G. L. Larson and R. F. Norris; Noise and Ventilating, by G. T. Stanton; Noise Reduction in Ventilating Units, by Warren Ewald; Air Leakage through Various Forms of Building Construction, by Houghton, Gutberlet and Herbert; Welded Piping for Building Heating Systems, by F. G. Outcalt, and Air Conditioning for Railway Cars, by A. H. Candee; Capacity of Return Mains for Steam and Vapor Heating Systems, by Houghten and Gutberlet; Air Pollution from the Engineer's Standpoint, by H. B. Mellor; Smoke and Dust Abatement, by M. D. Engle; Air Conditioning as Applied to Interior Woodwork, by D. R. Brewster; Air Conditioning in the Bakery, by W. L. Fleischer; Ventilation System of the Holland Tunnel, by A. C. Davis; Utilization of Hot Springs for Heating in Iceland, by Ben Grondal; Off-Peak System of Electric Heating, by Elliott Harrington; Heating with Exhaust Steam, by Perry West.

For the Pittsburgh meeting reduced fare will be in effect under the Identification Certificate Plan. Railroads have authorized this plan and the certificates will be mailed to society members in advance of the meeting so that they may purchase round trip tickets to Pittsburgh at their home station.

General committee on arrangements consist of H. Lee Moore, chairman; H. B. Orr, chairman reception committee; F. C. Houghton, chairman program committee; R. B. Stanger, chairman entertainment committee; F. A. Gunther, chairman banquet committee; W. W. Stevenson, chairman transportation committee; J. E. McGinness, chairman publicity committee; F. C. McIntosh, chairman finance committee.

Exhibitors Committee of Industrial and Power Shows Incorporates

FOR 4 YR., the Exhibitors Committee of the Power Shows has been at work gathering data and submitting it to exhibitors for their information. From a participation of 40 members, its scope has extended to service to 700 manufacturers evidencing the belief in effectiveness of concerted action by a centralized organization as compared with individual effort. At the meeting on Dec. 4 in New York after a review of the Committee's work by Carl Stripe, Chairman, Publicity Manager of Combustion Engineering Corp., by Robert M. Gates, Vice-President of the Superheater Co., by R. H. DeMott, Sales Manager of S.K.F. Industries, by Frank Page, Publicity Manager of the Foster Wheeler Corp. and by Lew Gordon, General Manager, W. R. C. Smith Publishing Co., it was announced that the Exhibitors Committee of Industrial and Power Shows, Inc., is an established constructive force in the field, to do work impossible by individual action. It has permanent headquarters at Room 413, 420 Lexington Ave., New York City, and will gather and disseminate information as to conditions, extent and purpose of established and proposed exhibitions to aid manufacturers in solving show problems and in reaching intelligent decisions as to use of this means of publicity.

News Notes

A PRELIMINARY PROGRAM has been announced for the 1931 Midwinter Meeting of the National Electrical Manufacturers Association to be held in New York, January 19-23.

Over thirty meetings are planned for sections, groups and committees. At a special dinner meeting on Tuesday, January 20, there will be addresses by President Clarence L. Collens and an eminent speaker from outside the industry who will discuss current economic conditions. A meeting of the Board of Governors is scheduled for January 20, the Standards Committee for January 22 and the Casualty & Fire Prevention Committee for January 23.

That portion of the industry devoted to electrical supplies will be particularly active in the meeting, though groups devoted to other products are also included in the program. All of the meetings will be held at the Association headquarters or the Hotel Commodore.

ESCHER WYSS & Co., Zurich, has just completed the first of four 30,000-40,000 hp. capacity units, which are being built for the Ryburg-Schworstadt hydroelectric power station on the Rhine. Of the remaining three turbines, one is being constructed by the Ateliers de Charmilles in Geneva, and two by the Voith Engineering Works of Heidenheim, Germany.

MODERN COAL BURNER CO., 3733 Lincoln Ave., Chicago, Ill., has prepared a lantern slide lecture on the subject of stokers for small boilers. There is a box of slides with the lecture, set up in such a way that the secretary or chairman of a meeting can present the lecture. Further information about it can be obtained from the company.

AUTHORITY for purchase of six utility companies in the St. Joseph, Oakwood, Ill., community, serving more than 40 towns, by the Rockford Gas, Light and Coke Co., has been sought from the Illinois commerce commission and basis of exchange of stock involved in the deal, with authority to issue $17,500,000 first and refunding mortgage gold bonds and 20,000 shares no par common stock. The six companies involved and the stock in the purchasing company they will receive in exchange for their properties are as follows: Rockford Electric Co., 15,300 shares, valued at $10,641,000; Illinois Public Utilities Co., serving Lincoln and 37 other towns, 4,530 shares, $3,184,000; St. Joseph-Oakwood Electric Co., 82 shares, $61,000; United Fuel Transportation Co., Chicago, 44 shares, 31,000; Emden Water, Light and Power Co., 35 shares, $22,000; Rural Gas Supply Co., five shares, $3,000.

Merging of the seven utilities will result in a new subsidiary of the Central Public Service Corp., with headquarters in Rockford, Ill., occupying the new Gas and Electric building, being erected at North Main and West Jefferson street in Rockford. The new subsidiary will have $20,000,000 capital and the formation was undertaken at this time, Adam Gschwindt, general manager of the Rockford utilities explained, because of the advantages of the bond market at this time. Present officers of the utilities outside Rockford will be retained but a new general manager will be appointed for the entire corporation, it is anticipated. Central Public Service is expected also to establish a large engineering department in the Rockford utilities building to serve its mid-western properties.

ANNOUCEMENT has been made by W. Spencer Robertson, president of the General Water Treatment Corp., that the organization of that company had been effected by the exchange of over 90 per cent of the outstanding capital stock of The Permutit Co. for stock of General Water Treatment Corp. and the acquisition of all of the capital stock of Ward-Love Pump Corp. The time within which the remaining outstanding stock of The Permutit Co. may be exchanged for stock of General Water Treatment Corp. on the basis of twelve shares of General Water Treatment Corp. stock for each share of Permutit Co. stock has been extended to December 31, 1930.

The General Water Treatment Corp. through its subsidiaries will engage in the manufacture and sale of water systems and equipment and minerals for the softening, purification or other treatment of water.

The directors of the company are Francis N. Bard, Vincent Bendix, Harry M. Durning, William M. Flook, W. Spencer Robertson and Kenneth B. Schley. The officers are Francis N. Bard, chairman of the Board; W. Spencer Robertson, president; Harry M. Durning, vice president; H. W. Pratt, secretary and treasurer.

DUNBAR ENGINEERING CO., 122 East 42nd St., New York City, is now representing The Edward Valve & Manufacturing Co. in those portions of New Jersey, Pennsylvania, Delaware, Maryland and Virginia, which have heretofore been handled by representatives located at Philadelphia and Baltimore.

MARLEY CO., Kansas City, Mo., announces the opening of a direct district sales office at 6 East 45th St., New York City, with J. C. Albright in charge as district manager. Mr. Albright comes with the Marley Co. after several years connection with the Bailey Meter Co. of Cleveland, Ohio.

TO IMPROVE its service in the Chicago area, the American Hoist & Derrick Co., with offices at 205 W. Wacker Drive, has purchased warehouse facilities which will enable it to carry complete stocks of new machines and repair parts for the prompt service of all users of its machinery.

AMERICAN MANGANESE STEEL CO., Chicago Heights, Ill., requests that in the interest of improved service and quicker attention to inquiries, all communications should be addressed to its Chicago Heights office in the future. The Southern Manganese Steel Co., more recently known as the Southern Manganese Steel Division of Amsco, is transferring all matters pertaining to sales from St. Louis, Mo., to Chicago Heights, Ill.

JAMES K. AIMER, has been appointed assistant general manager of sales in charge of railroad, locomotive and car equipment Sales, also bar iron and billets sales for Reading Iron Co. Mr. Aimer is located at 230 Park Avenue, New York, N. Y. He will assume complete supervision and direction of all sales to railroads and in addition will direct the sales of boiler tubes, formerly under the direction of Geo. H. Woodroffe, metallurgical engineer. Mr. Woodroffe will now handle all complaints and serve in an advisory capacity to the general sales organization with respect to technical problems.

F. W. PEEK, JR., has been appointed chief engineer of the Pittsfield, Mass., works of the General Electric Company, effective January 1, it has been announced by E. A. Wagner, manager of the works. Mr. Peek succeeds Guiseppe Faccioli, who retired a few months ago from active participation in the affairs of the company because of ill health.

Mr. Peek, who has been a consulting engineer of the company at Pittsfield, entered the General Electric Company "on test" in 1905, following graduation from Leland Stanford University in the same year. When the consulting engineering department was formed by Dr. Charles P. Steinmetz in 1909, Mr. Peek was one of the first to join it. Since then he has done general consulting work on practical and theoretical engineering problems and research work. In 1911 he received the degree of Master of Electrical Engineering from Union College for work done in connection with high-voltage transmission.

In 1916, to keep in better contact with the development of high-voltage transmission and engineering, Mr. Peek went from Schenectady to Pittsfield, where the high-voltage laboratory is located. Probably the best known research work of Mr. Peek is the formation and establishment of laws regarding corona, the investigation of lightning and its effects on high-voltage transmission, the study of dielectric phenomena, line insulations and the problems connected with the transmission of high-voltage currents.

Mr. Peek is the author of more than 200 papers in different scientific and engineering publications. Inventions relating to high-voltage insulations, transmission lines, lightning arresters, electro-chemical subjects, etc., are credited to him. He is a member of several scientific and engineering societies. Honors bestowed upon him include the Thomas Fitch Rowland prize from the American Society of Civil Engineers in 1923, and the Levy medal from the Franklin Institute in 1926.

JOHN J. O'BRIEN, president, Standard Gas and Electric Co., announces that the company's construction budget for 1931 will total $43,596,257. The company's construction program included in this amount provides for an additional generating unit of 35,000 kw. capacity to be built at the Riverside plant of the Northern States Power Co. in Minneapolis, a hydroelectric station of 40,000 kw. capacity to be built for The California-Oregon Power Co., and two transmission lines connecting the Minnesota Valley Steam Plant at Granite Falls, Minnesota, with other parts of the Northern States Power Co. system. The additional steam capacity provided for in the Northern States Power Company system will not be placed into service until the fall of 1931 and the new hydro-electric plant in The California Oregon Power Company system will not be in service until 1932.

There are projects now in progress of construction at properties in the Standard system amounting to $12,911,655 which will not be completed during 1930, costs for which are included in the total budget figure of $43,596,257. The total budget expenditure may be segregated as follows: electric department, $31,176,159; gas department, $6,206,377, and other departments, including general construction, $6,213,721.

During 1930, according to Mr. O'Brien, five major electrical projects of an engineering nature were practically completed, adding 125,500 kw. to the system and bringing the total installed steam and hydroelectric generating capacity in the Standard system to 1,521,203 kw. Engineering and construction services for these projects were rendered by Byllesby Engineering and Management Corp.

HENSZEY DE-CONCENTRATOR CO., Watertown, Wis., announces the appointment of Himelblau, Agazim & Co., 30 No. Dearborn St., Chicago, as sales representative for the Chicago territory.

AMERICAN MANGANESE CO., Chicago Heights, Ill., has been granted an exclusive license by Grover C. Voit of Hopedale, Ohio, to manufacture and sell the Voit dipper front.

LUMMUS CO., a new engineering and contracting firm having authorized capital stock of $10,000,000, has been organized to take over the business of the Walter E. Lummus Co., of Boston, Mass. The Superheater Co. and The Babcock & Wilcox Co. hold substantial blocks of stock in the new firm. The Lummus Co. will engage in the design and manufacture of distillation and refining equipment for the alcohol, chemical, and petroleum industries, thus following the lines of activity pursued by the Walter E. Lummus Co., but operating on a larger scale. The facilities of The Superheater Co. and The Babcock & Wilcox Co. combined with those of the Lummus organization will, it is claimed by Walter E. Lummus, president of the new company, provide a well rounded and scientific organization able to cope with many problems in the industries served. Officers and directors of the new Lummus Co. are: President, Walter E. Lummus; vice president, Raymond R. Collins; secretary, Raymond R. Collins; treasurer, Walter E. Lummus. Directors are: Walter E. Lummus, George L. Bourne, F. J. Faulks, Raymond R. Collins, F. A. Schaff, C. W. Middleton and A. G. Pratt.

ARITHMETIC OF ELECTRICITY. By T. O. Sloane. Twenty-third revised and enlarged edition, 230 pages, size 5 by 7, cloth, illustrated. Published by The Norman W. Henley Publishing Co., 2 West 45th St., New York, 1930; price, $1.50.

This handy little book has been popular for many years among those engaged in practical electrical work and who are not possessed of an extensive mathematical education. It is devoted to a simple development of the laws of electrical computation, and makes use of only the simplest methods of calculation. Insofar as possible no algebra is used in the main body of the book; it is used at a slight degree in the latter part of the book, in the demonstration of rules, but these latter chapters are in no way necessary, in working out the practical problems with which the book is mainly concerned.

Books and Catalogs

Algebra, which is the shorthand of arithmetic, is beyond the scope of many workers in the realm of electrical engineering and in this book the elaborate and detailed calculation of problems by plain arithmetical processes gives a better understanding of the question than perhaps can be obtained by any other method. Often the arithmetical solution involves a complete analysis of conditions which a mere formula does not give, and it is the belief of the author that in adhering to the simpler mathematics, he is not only meeting the wishes of many readers but also that he is leading them on a path of better analysis and investigation than that traced out by shorter methods of the higher mathematics.

Beginning with a chapter discussing the units of measurement and in electrical engineering, the book takes up Ohm's law, resistance and conduction, potential difference, work and energy, batteries, electrodymanic machinery, capacity and inductance, alternating currents, etc. The chapters on alternating current work, capacity and inductance is reasonably complete and it is surprising how much can be done even in these branches by simple arithmetical calculations.

A new chapter on "networks" has been added in the present edition, which enhances the value of this little volume. The book is well made and has an excellent index. We do not hesitate to recommend it.

COMMERCIAL A. C. MEASUREMENTS, by G. W. Stubbings. First Edition, 325 pages, 5½ by 8¼ in.; 169 diagrams, cloth. Published by D. Van Nostrand Co., 250 Fourth Ave., New York, 1930; price, $6.00.

This book, it appears, satisfies a distinct need in the literature of electrical measurement and the authors seem to have done a creditable piece of work in writing it. The subject of commercial electrical measurement is one of the highest importance as anybody connected with large electrical distribution systems can testify. The average utility company will spend more money in a year on service meters than on turbo-generators. This in itself is startling but when we consider that the revenue taken in by the sale of current is largely dependent upon the accuracy of these service meters, the importance of the subject of commercial measurement will be evident.

Most of the existing material on the subject of electrical measurements as pointed out by the author tends to fall within one of two categories; that of the more or less descriptive treatise, or that of the handbook of electrical testing. This book falls into neither of these classes but concerns itself with the theory and practice of the measurement of current, voltage, power, energy and power factor in a.c. circuits in an exhaustive manner.

It is most concerned with the details of construction of electrical instruments, and only such descriptive matter has been included as is necessary for the elucidation of the principles of the method of measurement concerned. This is much to be desired. Details of construction of instruments always can be obtained from catalogs or manufacturers instruction books, but a theoretical discussion of the principles involved, can not be obtained usually without considerable effort.

As an introduction to the subject, the book opens with a short resume of elementary a.c. theory, considered particularly with respect to its bearing on a.c. measurements. The subject of three phase measurements has been dealt with at some length, and the somewhat difficult conceptions of power factor and volt amperes in an unbalanced three phase circuit have been illustrated by the method of resolution into symmetrical components. Considerable space also has been allocated to instrument transformers and to methods of measuring their errors. Methods of, and instruments for, measuring reactive power, and kilo-volt amperes have been considered in detail.

A final chapter deals with the somewhat wide subject of test room equipment and here are found some practical directions for obtaining artificial power factors for testing work which should prove of use.

The mathematics used throughout the volume has been kept as simple as consistent with a subject inherently mathematical in character.

Although written primarily for testing engineers and for senior students who wish to specialize in the subject of electrical measurements, it should be of interest generally to other engineers engaged on the technical side of the electrical industry.

STATISTICAL ABSTRACT of United States Industries, a volume of 800 pages in bound form, is being issued by the Bureau of Foreign and Domestic Commerce, Washington, D. C. This gives data in regard to all phases of economic and social life, such as the people employed in a particular industry, production of that industry, capital employed, amount of power used and a mass of miscellaneous data on population, banking, transportation, education, elections and similar subjects. Copies may be had by sending $1.00 to the Superintendent of Documents, Washington, D. C.

AXIFLO, HIFLO AND CONIFLO DEEP WELL PUMPS for deep well, sump and irrigation service are described in a recent 32-page bulletin by Worthington Pump & Machinery Corp., 2 Park Ave., New York City. Designs of the pumps is shown by line drawings, methods of installation by line drawings and photograph, and the bulletin contains a great deal of engineering information on capacities, pump characteristics and application of these units to various service.

B. & W. No. 80 FIREBRICK are described with engineering data and load test curves in bulletin B12-A by the Babcock & Wilcox Co., 85 Liberty St., New York City.

WORM GEAR SPEED REDUCERS for small electric motor drives in capacities up to 7 hp. and ratios from 5 to 1 up to 50 to 1 are described in a recent bulletin by W. A. Jones Foundry and Machine Co., 4401 West Roosevelt Road, Chicago.

VERTICAL STEAM ENGINES for stationary and marine service, of the enclosed self-oiling type with piston valve in single and twin cylinder construction, are described in bulletin No. 304 by Troy Engine & Machine Co., Troy, Pa. General description is given of the engines and of the various parts, such as connecting rod, crank shaft, valves, flywheels, governors and cylinders, and the bulletin contains engineering data on speeds, horsepowers and dimensions. The company has also issued a bulletin No. 602, describing generators of bracket and engine types for direct current and alternating current. Details of these are described and illustrated and tables show capacities, dimensions and weights of the various equipment.

RECENT HISTORY of steam power plants is reflected in Bulletin No. 688, describing feed water heaters, issued by the Cochrane Corp., Philadelphia, Pa. Efficiency of the non-condensing steam plants of 30 yr. ago was greatly improved by utilizing exhaust steam to heat the boiler feed water to around 210 deg. F. Now, extracted or bled steam is utilized in high pressure condensing plants to heat the feed water to well over 300 deg. F., not in one heater but progressively in a series of heaters, each receiving steam which has been expanded in the prime mover to the temperature to which the water is raised. By using a sufficient number of such bleeder heaters, the efficiency of the perfect thermodynamic cycle is closely approached. The feedwater heaters may take any one of a number of forms, including open heaters, closed heaters, deaerating heaters, metering heaters, vacuum heaters, back pressure heaters, jet heaters and storage heaters, as also hot process softeners, in which chemical treatment is combined with heating. The bulletin describes this equipment, shows by photograph and line drawing how it is used and contains valuable engineering data on the general subject of feedwater heating.

LINK-BELT CO., Philadelphia, Pa., has issued a 16 page book describing the P. I. V.—all metal variable speed transmission. The booklet shows the applications in industry, the details of the device and the method of its operation. A copy will be furnished to readers who write to the company.

A NEW PUBLICATION, issued by the Westinghouse Electric and Manufacturing Co. and designated as Leaflet 20,508, describes the Westinghouse Type FO-22 outdoor automatic reclosing equipment, designed for use on feeder circuits.

This equipment consists of an oil circuit breaker that, upon the occurrence of a short circuit, automatically trips and then recloses. If the fault is not cleared in the meantime, the breaker trips and recloses three times before locking out.

AN ILLUSTRATED leaflet describing Pothead Type Transformers has recently been announced by the Westinghouse Electric and Manufacturing Co. Listed are the advantages of these transformers for the three general types of potheads. These types are compound filled single compartment potheads, oil filled single compartment potheads and double compartment type potheads.

ALTERNATING CURRENT and direct current controllers for automatic printing presses are described and illustrated in bulletin No. 116 just issued by Monitor Controller Co., Baltimore, Md.

SINGLE STAGE CONDENSATE PUMPS designed for use principally where low operating heads are encountered, are described in a new bulletin, No. L-20426 by the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa. They have been developed to provide efficient reliable units with low installation and operating costs. They are of the horizontal, volute, centrifugal type, employing a double section impeller with opposed inlets.

MURRAY TYPE A WATER TUBE BOILER, an improved form of the long-drum horizontal water tube boiler is described in new catalog No. 98, issued by Murray Iron Works Co., Burlington, Iowa. Details of the various parts are shown by photographs and installations in buildings and industrial plants are described.

TYPE AA RELIANCE induction motors with ball bearings, for two and three-phase alternating current circuits are described in bulletin No. 109 by the Reliance Electric & Engineering Co., Ivanhoe Road, Cleveland, Ohio.

BINKS SECTIONAL LOUVER FENCING for spray pond service as recently described in detail in Power Plant Engineering, is further discussed in a recent bulletin by Binks Manufacturing Co., 3114 Carroll Avenue, Chicago.

UNION L TYPE BOILERS designed for limited space conditions, to combine production of dry steam, unrestricted circulation, high efficiency and reliability as described in a recent catalog of Union Iron Works, Erie, Pa. Details of these boilers were recently given in Power Plant Engineering.

IN A 72-page illustrated bulletin No. 12, Kennedy-Van Saun Manufacturing and Engineering Corp., 2 Park Avenue, New York City, discusses the subject of radiant heat from air floated pulverized coal. An introductory discussion is given of pulverizing principles and various types of equipment available for pulverizing with information on the importance of fine pulverization. Coal distributors are described, details of various types of burners made by the company are given and the use of these burners with the Kennedy air-cooled wall, water-cooled wall and the Kennedy shadow wall are shown. The Kennedy air-swept tube mill system is described, with data on a worm-drive noiseless air-swept tube mill, details of the disc feeder, plans for pulverized coal equipment. Many photographs of installations are shown both for stationary and marine service, tables of engineering data are presented and the bulletin contains a great deal of engineering information on combustion.

NEW CATALOG of belting packing, hose, and miscellaneous items for industrial use has just been issued by the Diamond Rubber Co., Inc., Akron, Ohio.

AMERICAN ROLLING RING CRUSHERS and Pulverizers for reducing and sizing various materials are described and illustrated with tables of speed, capacity, horsepower and dimensions in a 8-page illustrated bulletin just issued by American Pulverizer Co., St. Louis, Mo.

BLOWOFF VALVES of various types are described in detail and well illustrated in an attractive 40-page bulletin recently issued by Yarnall-Waring Co., Chestnut Hill, Philadelphia, Pa. This describes various types of seatless valves, double-tightening valves, tandem valves, arrangement for continuous blow-down and gives dimensions, details of parts of valves, and illustrations of typical installation. Operating data and notes on operation are presented together with data on the Yarway water column and gage, industrial uses of Yarway valves and data on the Yarway involute spray nozzle.

MODERN STOKERS for Modern Settings is the title of a new 32-page illustrated bulletin just issued by the Detroit Stoker Co., Detroit, Michigan, describing the Detroit multiple retort stoker. Details of the various parts are described and illustrated and typical installations are shown by line drawings and photographs. The company has also issued another well illustrated 12-page bulletin entitled Economical Steam Generation in Canada. This contains data on various types of stoker installation this company has made in Canadian power plants. Good reasons Why You Should Buy the Detroit Unistoker are given in another 8-page bulletin, discussing in detail the construction of this unit and showing how it is applied to various conditions. Automatic Heat at Low Cost, an 8-page bulletin just issued, describes the Detroit Junior Stoker designed primarily for smaller applications such as apartments, hospital, stores and offices, greenhouses, laundries, and the like. Detroit Stokers of the single retort type are fully described and illustrated in another 32-page bulletin. A 16-page, well illustrated bulletin discusses Detroit double retort stokers for heavy service. These are side cleaning dump double retort units designed for high capacity and the bulletin shows the various parts in considerable detail.

INDUSTRIAL DEVELOPMENTS in the United States and Canada during 1926 and 1927, a summary of the survey made by the Civic Development Committee of the N. E. L. A. and the Policyholders Service Bureau of the Metropolitan Life Insurance Co., New York City is issued in bulletin form. This company is also issuing a 20-page bulletin on First Aid Service in Small Industrial Plants. This describes the equipment needed for proper first aid treatment, discusses its use and the importance of proper first aid service. The Accident-Prone Employee, a 28-page illustrated bulletin containing a study of electric railway operation undertaken by the Cleveland Railway Co. with the coöperation of Policyholders Service Bureau Metropolitan Life Insurance Co. This company has also issued a bulletin on Vacations for Industrial Workers, another on Industrial Hygiene and another on Making the Plant Safe.

Power Plant Construction News

Ariz., Florence—The Randolph Irrigation District, Florence, is considering the installation of a group of from 25 to 30 pumping plants for irrigation service, reported to cost more than $500,000, with equipment. The Scott Engineering Co., Ellis Building, Phoenix, is engineer.

Calif., Oakland—The East Bay Municipal Utility District, Oakland, is projecting plans for a hydroelectric power project on the Mokelumne River, Arador County, for service at Oakland, Berkeley, Alameda and vicinity, entire project reported to cost more than $1,000,000.

Calif., Pasadena—The City Council has plans nearing completion for superstructure for proposed addition to municipal electric light and power plant, 108 x 150 ft., to cost about $50,000, exclusive of equipment. Bennett & Haskell, First Trust Building, Pasadena, are architects.

Calif., Pittsburg—The Redwood Mfg. Co. is planning rebuilding of portion of power plant recently destroyed by fire with loss reported in excess of $50,000.

Ga., Cordele—The Sawyer Coal & Ice Co., 277 Walnut Street, Macon, Ga., has plans for an ice-manufacturing and cold storage plant to cost about $70,000. C. T. Baker, Macon, is engineer.

Idaho, Idaho Falls—The City Council has made application to the Federal Power Commission for a permit to develop water power for a proposed municipal hydroelectric power station at Mesa Falls, entire project reported to cost more than $300,000, including transmission lines.

Ill., Duquoin—The United Electrical Coal Companies, Inc., Danville, Ill., are reported planning a new unit at their coal-mining plant at Duquoin, estimated to cost $125,000, with equipment.

Ind., Brazil—The Continental Chemical Corporation, Watseka, Ill., plans installation of electric power equipment in proposed new plant at Brazil, entire project reported to cost over $75,000.

Ind., Warsaw—The City Council is said to be considering the installation of a municipal electric light and power plant for service for street-lighting and other work. Harry Watkins, city clerk, has been authorized to engage an engineer to make a survey and estimates of cost.

Iowa, Des Moines—The Newens-Northland Milk Co., East Des Moines, plans installation of boiler equipment, oil burners and electric power equipment in connection with an expansion program at local plant, estimated to cost about $50,000.

Iowa, Sioux City—The Sioux City Serum Co., Stock Yards, plans installation of electric power equipment in proposed new plant unit consisting of four buildings, reported to cost more than $70,000.

Ky., Owensboro—The City Council is said to be planning the installation of boiler equipment and accessories at the municipal electric light and power plant.

La., Oakdale—The Common Council has authorized preliminary surveys for a municipal electric light and power plant. Estimates of cost will soon be made. F. P. Joseph, Glenmora, La., is engineer.

Md., Baltimore—The Public Improvement Commission, City Hall, is said to be planning the installation of pumping machinery and auxiliary equipment in connection with extensions and improvements in municipal waterworks. A bond issue of $25,000,000 is being considered to be used over a term of months.

Md., Childs—The Maryland Paper Board Co., recently organized, plans installation of electric power equipment in connection with establishment of local plant, comprising former mill of the Marley Paper Mfg. Co., lately acquired, to be remodeled and improved at a cost of $100,000.

Mass., Fitchburg—Crocker, Burbank & Co., Fitchburg, are said to be arranging an immediate call for bids for proposed new power plant at paper mill, reported to cost close to $100,000, with equipment. Francis J. Sill, East Main Street, Westboro, Mass., is engineer.

N. J., Garfield—The Garfield Crystal Ice Co., Midland Avenue, has filed plans for a two-story ice-manufacturing plant, reported to cost about $70,000, with equipment.

N. Y., Albany—The Sun Oil Co., 1608 Walnut Street, Philadelphia, Pa., plans installation of electric power equipment in proposed oil storage and refrigerating plant on the Hudson River, near Albany, entire project reported to cost over $100,000.

N. Y., Brier Hill—The Muller Dairy Co., plans installation of electric power equipment in connection with proposed rebuilding of portion of dairy plant, recently destroyed by fire with loss reported at close to $50,000.

N. Y., Gouverneur—The Board of Village Trustees, Gouverneur, has plans under way for a filtration plant for municipal waterworks, reported to cost more than $50,000. Alexander Pottery, 50 Church Street, New York, is engineer.

Ohio, Cincinnati—The Kentucky Chemical Mfg. Co., care of Harry Hake, 2400 Gilbert Avenue, Cincinnati, architect, has filed plans for a one-story boiler house at proposed new chemical plant on Este Avenue, entire project to cost over $100,000.

Okla., Erick—The Common Council is reported planning the installation of a municipal gas plant and proposes a bond issue of $50,000, for the project.

Okla., Hominy—The Common Council is said to have approved a bond issue of $150,000, for a municipal electric light and power plant, and extensions and improvements in municipal waterworks, including electric pumping equipment and accessories. It is understood that V. V. Long & Co., Colcord Building, Oklahoma City, engineers, will prepare plans.

Pa., Donora—The American Steel & Wire Co., plans rebuilding of portion of power house at local mill destroyed by fire Dec. 19. An official estimate of loss has not been announced.

Pa., Media—The Media Concrete Products Co., plans installation of electric power equipment in connection with proposed rebuilding of portion of plant recently destroyed by fire with loss reported in excess of $70,000.

Pa., Philadelphia—The Philadelphia Gas Works, Broad and Arch Streets, has filed plans for a one-story pumping plant on Gallows Lane, and will place work under way at once.

Pa., Pennsburg—The Perkiomen Trunk & Bag Co., Inc., Pennsburg, plans installation of electric power equipment in connection with proposed rebuilding of portion of plant recently destroyed by fire with loss reported in excess of $150,000.

Pa., York—The Arnold Ice Cream Co., plans installation of electric power equipment, ice-making and refrigerating machinery in proposed new plant unit, reported to cost about $75,000.

Tenn., Jamestown—The Tennessee Electric Power Co., is said to be planning rebuilding of power station at Jamestown, recently destroyed by fire. An official estimate of loss has not been announced.

Va., Newport News—The Virginia Gas Products Co., is said to be planning rebuilding of acetylene plant, recently destroyed by fire. An official estimate of loss has not been announced.

Wash., Seattle—Ford Motor Co., Dearborn, Mich., plans construction of one-story power plant at new assembling plant on Marginal Way, Seattle, where 30-acre tract of land has been secured, entire project to cost over $2,500,000. Bids will soon be asked on general contract. Albert Kahn, Inc., Marquette Building, Detroit, Mich., is architect and engineer.

Wis., Green Bay—The Shefford Cheese Co., Syracuse, N. Y., plans installation of electric power equipment in proposed new four-story plant unit at Green Bay, entire project reported to cost more than $75,000. Structure will be built by Atlas Warehouse & Cold Storage Co., Morrow Street, Green Bay, and occupied under lease.

Wis., Kimberly—The Kimberly-Clark Corporation, Neenah, Wis., plans installation of electric power equipment in connection with a new one-story acid works at local paper mill, entire project reported to cost over $80,000. Company engineering department is in charge.

Wis., Stevens Point—The Consolidated Water Power & Paper Co., Wisconsin Rapids, Wis., has plans for a pumping station at local plant, to include installation of two pumping units, each with capacity of 50,000 gals. per min., and auxiliary equipment. Company engineering department is in charge.